APR 22 19
UNIV. OF MICH.

The JOURNAL of the NATIONAL DENTAL ASSOCIATION

VOLUME VII NUMBER EIGHT

$2.00 A YEAR 20 CENTS A COPY

STUDY · PUBLISH · RECORD

AUGUST, 1920

Major General William C. Gorgas.—*Frontispiece.*

Movements of the Mandible and Efficient Restoration.—*Hall.*

Trismus.—*Eby.*

Surgical Technic of Apicoectomy.—*Lyons.*

Apicoectomy—Its Indications and Contraindications and Root-Canal Technic.—*Hartzell.*

Physiology and Pathology of Interest to Dentists.—*Sarrazin.*

Nitrous Oxid-Oxygen Anesthesia.—*Heidbrink.*

Pharmacology, Action and Toxicity of Various Local Anesthetics.—*Silverman.*

Indications and Contraindications for Nerve Blocking Anesthesia.—*Holt.*

The Essayist and the Discusser.—*Editorial.*

ADVERTISING DEPARTMENT.

Index, A-83. Classified Section, A-79, A-81.

CONTENTS

Page

Major General William C. Gorgas, 1854-1920 ..... Frontispiece

ORIGINAL COMMUNICATIONS.

Movements of the Mandible and Approximate Mechanical Imitation of These Movements for the Arrangement and Grinding of Artificial Teeth for the Efficient Restoration of Lost Masticatory Function in Edentulous Cases.
By Rupert E. Hall, D. D. S. 677

Trismus.
By Joseph D. Eby, Major, Dental Corps, U. S. A. 687

Surgical Technic of Apicoectomy.
By Chalmers J. Lyons, D. D. Sc. 700

Apicoectomy—Its Indications and Contraindications and Root-Canal Technic.
By Thomas B. Hartzell, M. D., D. M. D. 705

Physiology and Pathology of Interest to Dentists.
By Jules J. Sarrazin, D. D. S. 717

Nitrous Oxid-Oxygen Anesthesia in Oral Surgery and Dentistry.
By J. A. Heidbrink, D. D. S. 726

Pharmacology, Action and Toxicity of Various Local Anesthetics.
By S. L. Silverman, D. D. S. 737

Indications and Contraindications for Nerve Blocking Anesthesia.
By Frederick F. Molt, D. D. S. 739

EDITORIAL DEPARTMENT.

The Essayist and the Discusser 742

ANNOUNCEMENTS.

National and State Societies Meetings.—Susquehanna Dental Association.—American Academy of Periodontology.—Association of Military Dentists.—Idaho Dental Examination.—American Society of Exodontists.—John R. Callahan Memorial Fund.—Army Dental Corps.—Dental Corps Orders from War Department 744-746

IN MEMORIAM.

Death of Major General Gorgas 747

Death of Dr. Thomas L. Westerfield 748

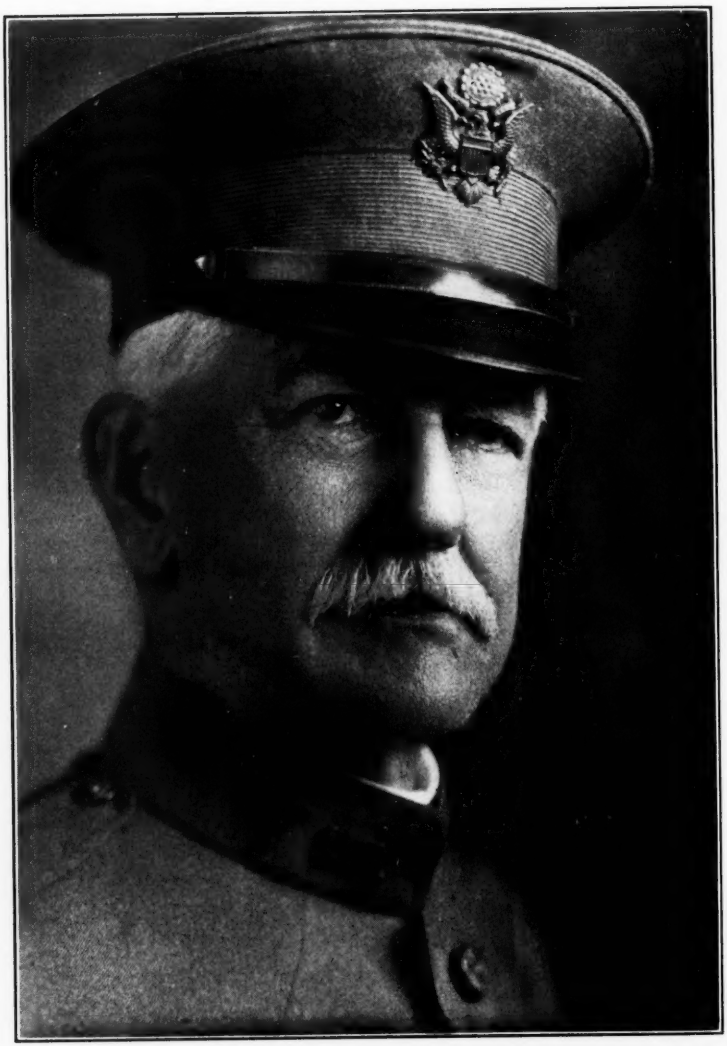
Waukesha County Dental Society Resolutions of Condolence to Dr. A. C. Coyle 749

Massachusetts Dental Society, 1918, 1919, 1920 749

ADVERTISING DEPARTMENT.

Index A-83

Classified Section A-79, A-81



MAJOR GENERAL WILLIAM C. GORGAS.
1854—1920.

THE JOURNAL
OF THE
National Dental Association
VOL. 7 AUGUST, 1920 NO. 8

Original Communications.

MOVEMENTS OF THE MANDIBLE AND APPROXIMATE MECHANICAL IMITATION OF THESE MOVEMENTS FOR THE ARRANGEMENT AND GRINDING OF ARTIFICIAL TEETH FOR THE EFFICIENT RESTORATION OF LOST MASTICATORY FUNCTION IN EDENTULOUS CASES.

By Rupert E. Hall, D. D. S., Prosthetist, Chicago, Illinois.

(Read before the National Society of Denture Prosthetists at Its First Annual Meeting, New Orleans, Louisiana, October 18, 1919.)

THE following four questions and answers will establish the premise upon which the investigations and work of the essayist were inspired and conducted.

1. By what influence are mandibular movements guided in incision and mastication as interpreted by investigators of the past and represented in articulators up to the present time?

Answer: The condyle paths.

2. By what influence are mandibular movements of incision and mastication guided according to the theory of the essayist?

Answer: The occluding planes of the teeth and not by the condyle paths.

3. About what points are the mandibular lateral movements of the mandible supposed to occur as represented by the theories and articulators of the past?

Answer: About a right and left axis (variable, Walker, Gysi) in the heads of the condyles in the glenoid fossae or about the heads of either condyle.

4. How does the theory of the movements of the mandible and articulator of the essayist differ from those of other theories and articulators?

Answer: Lateral movement occurs about a central variable axis in the median plane posterior to and above the condyles, instead of about bilateral centers in or about the condyle heads.

Accepting the theory, answer two, that the occluding planes of the teeth guide the movements of the mandible, it follows, as a logical sequence, that the prosthetist may arbitrarily choose such guiding angles as, in his opinion, will most definitely direct the movements of the mandible and efficiently restore lost masticatory function. It is the opinion of the essayist that teeth with deep cusps must definitely direct the movements of the mandible and efficiently restore lost masticatory function.

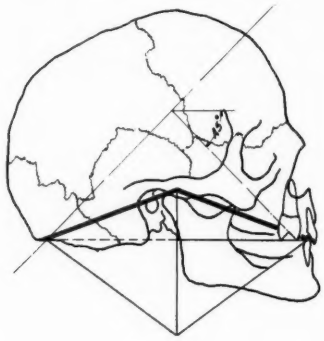


Figure 1.

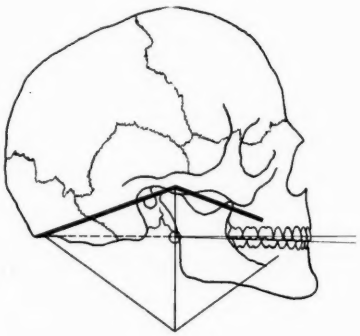


Figure 2.

Teeth with guiding cusp angles graduated according to the cusps of the upper first bicuspids, Figure 1, with cusp angles of 45 degrees, are chosen in our work because this angle is a typical geometrical angle and directs a more nearly balanced motion of the mandible, approximately combining equally the opening and lateral movements.

As pointed out by Bonwill, the depth of the cusps of the teeth graduate forward from the hinge joint, that is, the cusps increase in depth as the median line is approached and the greatest overbite is at the median line because this point is farthest from the hinge joint, Figure 2.

The cusps of the upper first bicuspids present the most definite cusp planes from which angle measurements may be taken. And since these teeth are the farthest teeth with lateral cusps from the hinge joint (center of opening movement), we believe them to be the key teeth upon which to base measurements for the guiding cusp angles, by which the angles of the other teeth may be graduated.

Nature very well substantiates the cusp angle of 45 degrees as the accepted angle. Testing the angle of the cusps of the upper first bicuspids in mouths possessing normal dentition, in which wear of the teeth has not materially modified their natural angle, yet been of sufficient extent to bring into apposition occluding and articulating planes characteristic of the natural teeth, when in the stage of greatest efficiency, leads us to believe that 45 degrees is the angle nature intended the cusp planes of this tooth to present.

You will now understand that our deductions to follow are based upon the acceptance of the theory that the articulating planes of the teeth guide the movements of the mandible and that 45

degree cusp planes (upper first bicuspids) is the ideal guiding angle.

Movements of the mandible, as guided by the planes of the natural teeth approximate geometrical laws. In artificial substitutes for the natural teeth we attempt to construct dentures which will simulate nature. The nearest approach to this is by means of the aid of an apparatus, which, being of a design and a construction of human ingenuity, is geometrically exact. Dentures constructed upon such an apparatus will approximate nature as the limit, or as the ideal. In mathematics we are taught that, as a variable approaches a limit the difference between the variable and the limit in the end becomes a negligible quantity. This is exactly what we have striven for in the field of articulator construction. The difference between nature and the articulator to be presented we believe to be negligible.

Figure 3 illustrates the theory of a variable approaching a limit. The circle represents the limit and the intersections made by the tangents to the circle represent the formation of the arc of an approximate circle approaching the arc of a true circle—as a limit.

To your sense of vision there appears to be a true continuous circle. In reality the quarter of the circle bearing the divisions is formed entirely by the intersecting tangents and is not an arc of a true circle, but an approximation of an arc of a circle as formed by these intersecting tangents.

Let the circle, representing the ideal, be illustrated by the movements of the articulator, and let the approximate arc, formed by the tangents—the variable—represent the closeness with which the movements of nature approach the ideal—the circle.

This demonstration is made to show the relation and negligible difference between nature—the variable—and the articulator—the limit—which we believe to be minimized to as low a degree as is required in a dental articulator for the restoration of edentulous cases in a practical and efficient manner.

For several years I have been contending that the only movements of the mandible that are of practical utility to the prosthodontist and desirable to be recorded in an articulator, are those slight movements that occur when the planes of two or more teeth are in contact. Therefore, reproduction of these movements only is all we aim for in our articulator. These movements are complex in character—the combination of

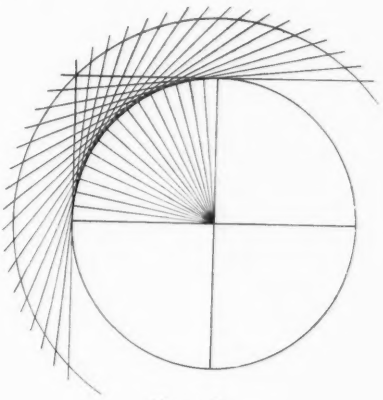


Figure 3.

two or more simple movements acting and reacting upon one another when operated simultaneously.

The rotation centers of the elementary movements are not fixed, but are variable. Each movement functionates around its own variable axis, and all are so related that, operated by the muscles and guided by the planes of the teeth, they coordinate automatically, producing the infinite combinations that make up masticatory movements and efficiency.

Let us first analyze these simple movements and then study them in combination.

First, we have the opening and closing movement, first in point of order because it is this movement that occludes

the teeth and in turn is required to unlock them before other movements are possible. The axis of this movement is located approximately at A, Figure 4, and lies in a horizontal plane at right angles to the sagittal plane and is located in a vertical plane below the heads of the condyles.

Second, we have the incisive movement, a movement in combination with the opening and closing movement, sec-

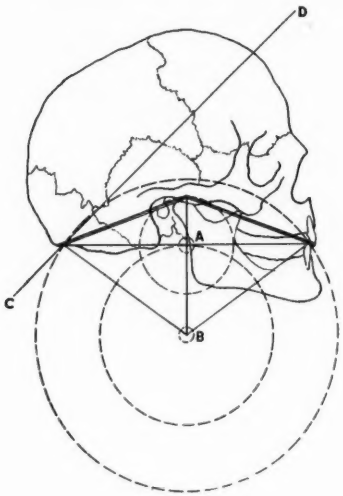


Figure 4.

ond in point of order because incision precedes mastication. The approximate location of the axis of this movement is at B, below and parallel with that of the opening and closing movement.

Third, we have the mandibular lateral movement, a movement in combination with the opening and closing and incisive movements, third and last in point of order because its use is in movements of mastication which succeed those of incision. The approximate location of the axis of this movement, CD, lies, we believe, not in or about the condyle heads to either side, as believed in the past, but in the median plane posterior to the condyles and in a plane oblique to the plane of the teeth.

The essayist's theory, geometrical scheme, Figure 5, of the movements of the mandible for the approximate mechanical imitation of these movements, is based upon an extension of Bonwill's triangle.

Dr. Bonwill took the mandible as the basis for measurements. While it is true that the mandible is attached to the cranium, of which the maxilla is an integral, it is also true that in nature's processes the mandible is first developed, the maxilla being thrown off as a lateral from it. But in making calculations for artificial reproduction of the movements of the mandible, we are compelled to work from a fixed basis. Quite evidently the mandible, which is freely movable in any direction, cannot form this basis. So we take the maxilla as the foundation about which to make our deductions.

Dr. Bonwill says the measurements of the upper jaw, tho slightly larger, must conform to those of the lower. Conversely, then, the measurements of the mandible must conform to those of the maxilla.

The triangle of the maxilla is described, by lines AA, AB and ABA, connecting the crests of the glenoid fossa of the temporal bone with each other and with the contact point between the upper central incisors. The line AA, between the crests of the fossa, is the base; B, the contact point of the incisors, is the vertex of the triangle. Theoretically, it is equilateral, with an average measurement of approximately four inches on each side. The triangle of the mandible, CDE, is of the same form, but slightly smaller, working inside the triangle formed by the maxilla, and is described by lines connecting the centers of the crests of the condyles and the contact point of the lower central incisors. The altitudinal lines of both triangles lie in the median plane or the sagittal plane of the skull.

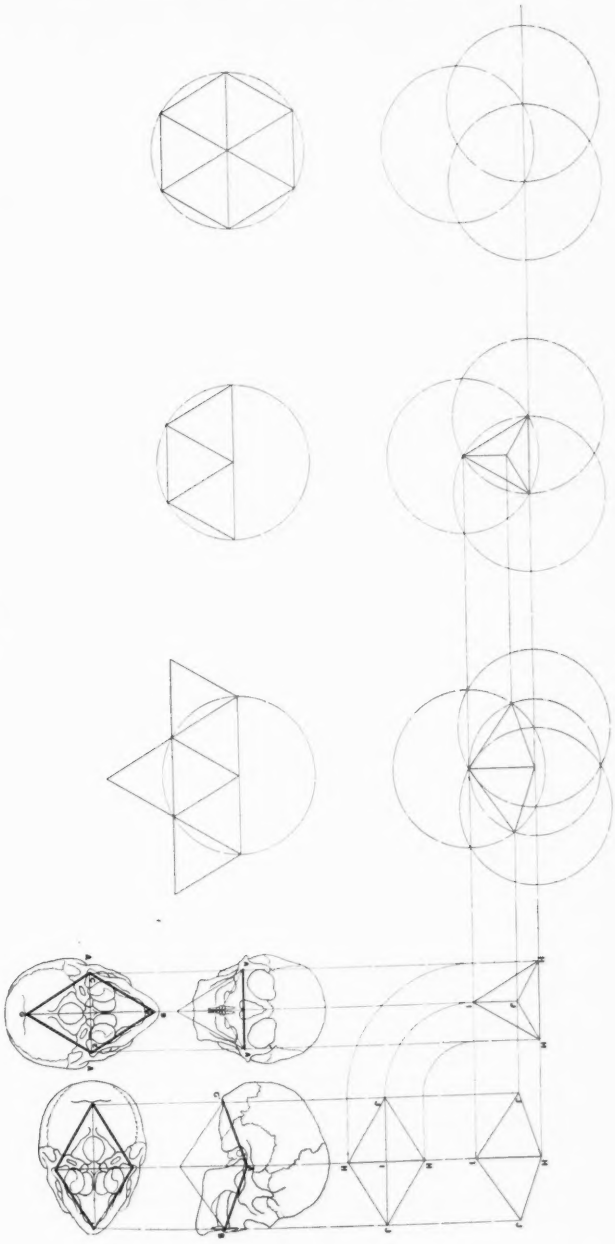


Figure 5.

If the maxillary triangle be conceived as folded back on its base as a hinge, its vertex, B, will take the position G in the region of the external occipital protuberance. The protuberance is thus seen to be at the same distance approximately from the condyles as the contact point of the upper central incisors and to form the vertex of a counter triangle to the maxillary triangle, AAG, which we may designate the occipital triangle.

The triangle in these two positions will be in different planes and will form

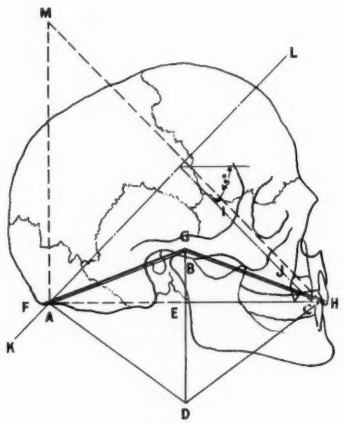


Figure 6.

a dihedral angle, G'AB, corresponding approximately to the dihedral angle between two regular triangular pyramids placed base to base to form a double tetrahedron, HHIJ, JHJI, and JHJHI.

ABCD, Figure 6, shows a side elevation of the double tetrahedron applied to the mandible with occipital and maxillary triangles, FG and GH superimposed. B stands for the line connecting the condyles (base of the triangle), C stands for the contact point of the central incisors (vertex of the triangle). And A stands for the occipital protuberance, the position assumed by the vertex of the triangle when the triangle is folded back on its base as a hinge. Line AC, between the two vertices—protuberance and contact point—describes the so-called occlusal plane. D is a basal corner of the figure. Line DB is the altitude of the figure in the vertical plane and intersects line AC, the occlusal plane, at right angles at E.

By the above deductions, we have geometrically determined approximate locations for the axes of the three elementary movements analyzed; namely, the opening movement, the incisive movement and the lateral movement.

We interpret this demonstration to point to E as the approximate center of the opening and closing movement, to D as the approximate center of the incisive movement, and to A—the external occipital protuberance—as the approximate center of the mandibular lateral movement.

Taking the external occipital protuberance as the center of the lateral movement describing the arc of a circle in the horizontal plane, we have the deflection of this movement vertically by the guiding cusp planes of the teeth. The inclination of the cusp plane of the key tooth, that of the upper first bicuspid, is projected, line IJ. A line projected from the occipital protuberance intersecting the prolongation of line IJ at right angles determines the axis of the resultant complex (complex to the plane of occlusion) movement so produced, line KL, establishing the axis of the oscillatory or rocking lateral movement of the mandible as guided by the laterally inclined planes of the teeth.

The center of the incisive movement of the mandible, while it may be typically located at point D, automatically finds its center any place below the mandible as guided by the over-bite.

Mechanical centers for movements, with which to imitate mandibular movements according to these geometrical centers, Figure 7, is shown in schematic form in Figure 8.

Figure 9 A shows a diagram and Figure 9 B a perspective view of the auto-

matic anatomic articulator for imitating the movements of the mandible according to these centers for use in practice.

Projection of the complex movement

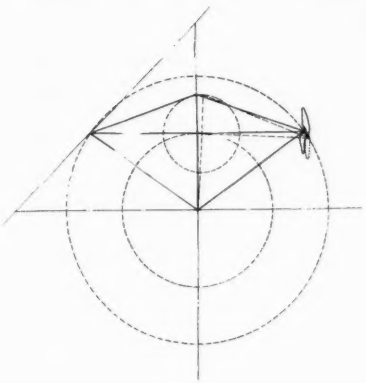


Figure 7.

occurring from axis KL, Figure 6, shows the movement, as represented by moving line AC—the plane of the teeth— to describe a cone, AMC, the vertex of

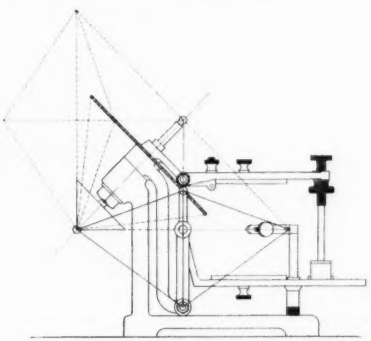


Figure 8.

which is located at the occipital protuberance, A.

Geometrically, line AC—the plane of the teeth—becomes an element of a cone, Figure 10, and the surface of a cone should, therefore, give off curves characteristic of the curves presented in the teeth of the upper arch.

Testing the Curves of the Surface of a Cone to Ascertain Their Likeness to Those Presented in the Teeth of the Upper Arch (Curve of Spee, Lateral Curve, and Curve of the Anterior Teeth.)

Wax caused to conform to the surface of a cone, in the shape of an upper dental arch, assumed the outline of curves *characteristic* of those presented in upper teeth. Teeth, of course, likewise assumed the same curves when adjusted to the cone, Figure 11.

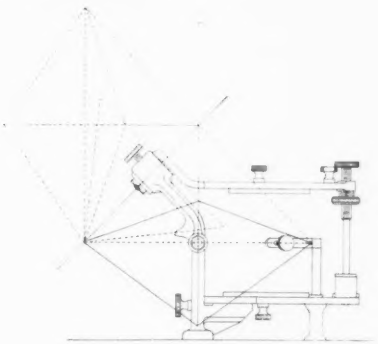


Figure 9 A.

Testing the Movements of the Articulator Constructed Upon the Theory of the Cone to Ascertain the Character of Curves Its Movements Would Cut in Wax.

Test of the movements of the articulator was made by mounting wax contour models and by the aid of pumice stone and oil, its movements were caused to grind down the surfaces of the occluded waxes to see the character of curves that would be cut and outlined in their surfaces.

The curved surfaces in wax cut by the movements of the articulator presented the *typical* tooth curves exhibited in the teeth, Figure 12.

Description of the Hall Automatic Anatomic Articulator.

The Hall Automatic Anatomic Articulator (Figure 9 B) consists of a base A, to which are attached two flat movable arms, B and C.

The lower arm B (lower jaw cast-carrier) slides in a frame projecting horizontally from the front of the base about an inch from the bottom. Near its outer end is a foot or support D, that serves to form a socket for the stem of the bite jig, which will be described further on. This arm may be projected or retruded from either position by an adjusting screw E. To retrude the arm, it is necessary to withdraw the stop screw to the position shown in 1 B, Figure 9 C. This movement is used to grind the teeth to accommodate the retrusive movement of the mandible and was an addition to the articulator suggested by Dr. M. M. House. The arm carries upon its upper surface a cast-plate F and an angular center-guide G. The cast-plate is detachable, and is held by a thumb-screw H; a center-pin in the top of the arm assures the correct positioning of the plate. The center-guide G is fixed to the arm with a set-screw. Its purpose is to center the upper arm in its lateral and vertical relations.

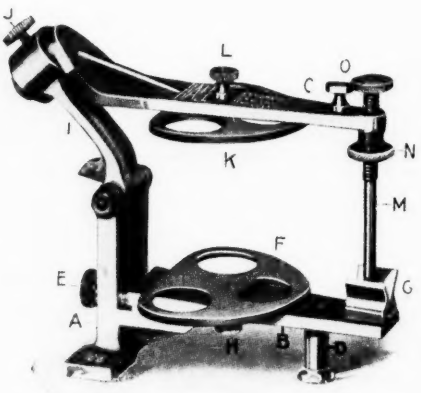


Figure 9 B.

The upper arm C (upper jaw cast-carrier) is pivoted to a bracket I, swung from the top of the base A. It has thus a lateral and up and down (oscillatory) movement, the former of which is governed by a thumb-screw J, known as the locking screw. It carries on its under side a cast plate K, like that on the lower arm but smaller, and is attached and detached in the same way by the thumb-screw L. At the outer extremity of the arm is a threaded eye, thru which passes a guide-pin M, that works in the center-guide G, of the lower arm. The eye is prolonged underneath to form a split screw-clamp, on which fits a clamp-nut N. This clamp-nut is for holding the guide-pin at any adjusted height. A bearing screw O, on the upper arm fixes the height of the guide-pin head when adjusting the articulator for the mounting of the casts and dentures for grinding. One side of the head of the bearing screw is cut away to allow the head of the guide-pin to pass it in opening the bite.

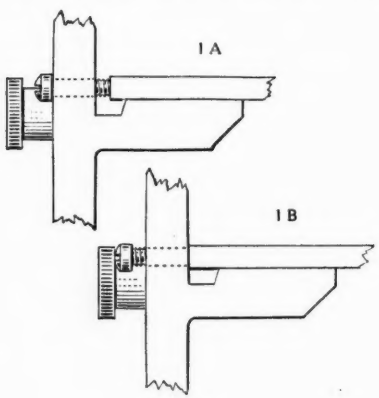


Figure 9 C.

The apparatus is completed with a bite-jig (Fig. 9 D), which takes the place of the face-bow in determining the vertex of the maxillary triangle and the co-called occlusal plane. The bite-jig consists of a stem A supporting an arch B. Pin CC at each side assures its going accurately to place in its socket in the support D (Figure 9 B). Near the top of the stem is a center pin D. At each end of the arch is a series of three screw-holes for necessary adjustments of the screw-pins EE.

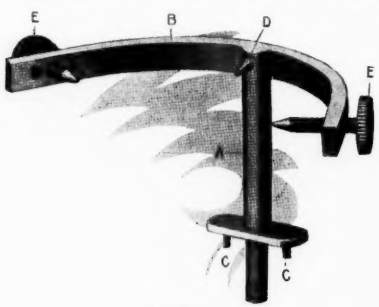


Figure 9 D.

We have thus an appliance with a horizontally adjustable lower arm holding the cast of the lower jaw, and an oscillating upper arm to carry the upper cast.

Testing the Movements of the Mandible to Ascertain the Character of Curves Nature Would Cut.

The interesting and unique test of having a patient grind the typical tooth curves directly in the mouth, was made by preparing rubber base plates upon which were mounted bite and contour models composed of equal parts plaster of Paris and carborundum powder. The rubber and plaster carborundum models were next inserted into the mouth, the mouth partly filled with water and the patient instructed to make masticatory movements. Frequent cleansing of the mouth of the cutting, water and saliva was made, clean water applied and the chewing process continued until the working occluded bite relation and definitely outlined curves were established.

The curved surfaces in the Plaster-carborundum, cut by the movements of nature, presented the *typical* tooth curves exhibited in the teeth, Figure 13.

The curves produced from off the

Figure 10.

surface of the cone, the curves cut by the articulator and those produced by the chewing process of nature were thus

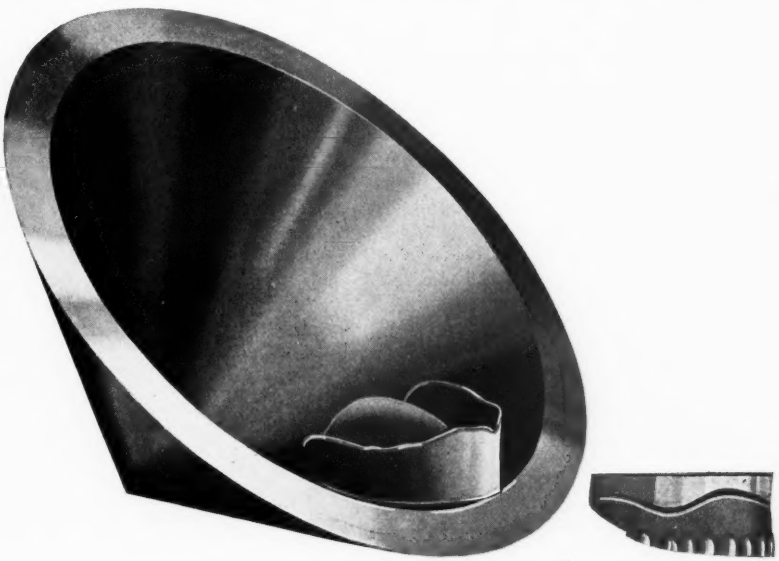


Figure 11.

found to resemble one another and all to be characteristic of those occurring in the natural teeth. The curves cut by the articulator and those cut by nature were practically identical in outline.

Automatic grinding of the teeth, under the varying movements of the articulator, which I will demonstrate in our clinics, and which will be elaborated upon in a most comprehensive manner by Dr. House in his paper before the National Body, delivers dentures that fulfill the requirements and tests exacted of scientific restorations in a most satisfactory manner.

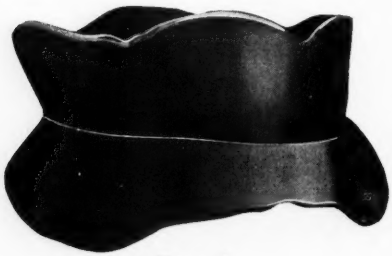


Figure 12.

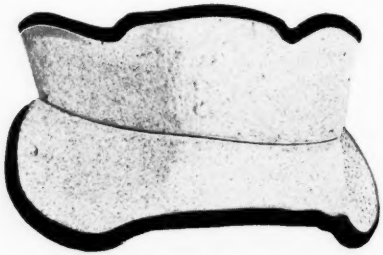


Figure 13.

Conclusion.

Since it has been demonstrated that the characteristic curves of the guiding upper teeth are found to be given in the curves of the surface of a cone, and the typical tooth curves have been reproduced with the movements of the articulator, constructed upon the principle of the cone, that are practically identical with those ground by nature, and since the soundness of the articulator as a basis for practice has also been amply verified, the theory of the cone should, in the present light of knowledge, be accepted as correct in principle.

TRISMUS.

By Joseph D. Eby, Major, Dental Corps, United States Army.
Walter Reed General Hospital, Washington, D. C.

(Published with permission of the Surgeon General, U. S. Army, who is not responsible for any opinion expressed or conclusions reached herein.)

THIS condition is: A limitation in the motions of the mandible caused by agencies not associated with the temporo-mandibular articulations. Whether the functions of the mandible are limited very slightly as in the condition of a very small scar contraction, a small adhesion, etc., or if the mandible is immovable as in the case of myositis ossificans (ossification of muscle) or from very extensive scars, the condition is termed trismus and the wide variance should be treated very similarly, with such modifications of the correct principles necessary only to meet the requirements of individual cases.

Trismus is not to be considered as a disease or injury, but is rather more the result and one of the concluding sequelae which follows after the active stages are healed.

Etiology. The causative agencies in the production of this condition may arise from devious origin, usually traumatic, pathological, nervous, or by their combinations. In Gould's Medical Dictionary, trismus is defined and classified etiologically as follows: "Spasm of the muscles of mastication, the condition commonly called lock-jaw, a tetanic condition of the muscles of mastication; or trauma caused by external violence. Capistratus; a condition in which the jaws cannot be separated because of adhesions between the cheeks and gums following ulceration of the parts. Cerebral; arising from lesions in the central nervous system and transmitted into the cranial nerves. Catarrhalis Maxillaris; neuralgia of the jaw. Dolorificus Tic; muscle spasm of obscure origin usually the result of a local irritant, such as infected teeth and sinuses."

Symptoms. The chief outstanding symptoms are demonstrated by the limited motions in the mandible. Further examination and the statement of the patient will reveal the location and cause of the condition, and other points, such as evidence of pain and a careful study of the regional anatomy will determine a fair conception of the exact condition following which the indications of treatment may be readily determined which will usually prove effective following the original careful diagnosis whereupon if proper treatment is elected, it rarely if ever becomes necessary to change the method in order to procure the best results because of the fact that the symptoms of this condition are usually too unmistakable to fail to recognize. It is not at all infrequently the case that owing to the vicissitudes of temperament, or by the deliberate efforts, the patient will endeavor to make it appear that the condition is worse than it really is. A positive test which will prove the greatest extent of motion existing in the mandible may be conducted by inserting a tongue depressor into the mouth and with a long applicator covered on the end with a tuft of cotton, the pillars of the fauces may be stroked so as to produce gagging, then by pressing downward against the lower incisor

teeth with the tongue depressor or a Millimeter Gauge, the patient will involuntarily open the mouth usually several Mms. wider than by voluntary effort.

Early Treatment, Surgical and Therapeutic. A radiographic survey should always be made as a routine for the following purposes:

(A) For the location and removal of all septic teeth.

(B) To eliminate anomylies.

(C) For the location and removal of foreign bodies.

(D) To apprehend ossified muscular substance.

(E) To locate mal-solidification of comminuted fractures.

If mechanical resistance is found such as the ossification of the muscle (myositis ossificans) or if it is found that some process of the mandible is solidified with other facial bones, preparations must be made for their resection. This requires surgical procedure *after* suitable mechanical apparatus has been prepared for the purpose of stretching and retaining results accomplished which is not infrequently needed in maxillo-facial injuries from missile wounds. Conditions which cause trismus and which require interference are myositis (ossificans) mal-solidification of bone fragments and extensive contracted adhesions, usually scar tissue.

Myositis Ossificans has been discovered in two cases treated at this hospital. One case was that of a high explosive fragment about 1 Cm cubic measurement which entered the face over the Malar process where it tore thru the periosteum and traversing the Masseter muscle, burroughed into the periosteum of the mandible. The other case was of a H. E. fragment which entered thru the facial plate and tuberosity of the superior maxilla, traversing the internal pterygoid muscle making its exit into the throat. A rupture of the periosteum and the tract of the missile thru the muscles seem to liberate and permit of the invasion of osteoblasts with result that these muscles ossified completely. They contracted to perhaps two-thirds their normal size in all directions and as these tissue changes progressed the mandible was finally drawn into very tight contact against the superior maxilla. In the case of the Masseter muscle the entire muscle was resected by blunt dissection, while in the case of the internal pterygoid muscle, the middle third was excised.

Frequently a very positive trismus established results from the solidification of the mandible with other bones. Numerous cases have been treated wherein the path of a H. E. fragment, the Malar process and Zygoma are crushed inward, striking and fracturing the Coronoid process of the mandible, all of which are driven into zygomatic fossa. After healing, it will be found that comminuted fragments of these bones will have solidified or as a slight modification of a complete condition, the lacerated tendonous attachment of the temporal muscle and the formation of scar tissue thruout the zone, produces such a serious effect until surgical interference is necessary. There is very little value to be gained by any modified operations, it usually being necessary to sever the attachments of the temporal muscle, and to completely excise the Coronoid process. It is also well to make an effort to prevent reunion by quilting muscle or fascia over the raw surfaces of the bone exposed.

In order to release further extensive adhesions and contracted scar tissue in the muscular regions of maxillo-facial areas, surgical procedure is again indicated in the beginning. Where the buccal and labial mucosa are tightly adherent to the maxillary ridges, the operation of restoring the sulci by the process of grafting free skin inlays is the first step following which the deep excision of scar tissue and the plastic operations of scar excision and skin

grafting superficially usually effect material relief.

It is to be definitely understood that none of these operations are effected without the pre-operative adjustment of mechanical apparatus for stretching and to serve as retention of the advantages gained in the surgical relief.

The proper regard for the value of Therapeutics in this work should never be lost sight of for it is frequently the determining factor in a complete success and is always a valuable adjunct to a mechanical treatment. Massage is always stimulating and the manipulation thus gained aids in softening scar tissue. Physio-Therapeutics are invaluable for the softening and the dissolution of deep scar bands, for which Faradic electric current, Negative Ionization, and electric heat are most effective.

Mechanical Apparatus. A review of the French and British literature on this subject as well as the work of various officers in the Dental Corps, U. S. Army, reveals such a wide variance in the principles of force and design of apparatus until it will be perhaps best to consider the basic principles of indications and contraindications of various designs of apparatus and *types of forces* which may be employed.

In the comparison of apparatus which is "fixed" and that which is "removable," the following points have been observed: Fixed apparatus is very unhygienic and permanently injures both tooth structure and surrounding soft tissue. Fixed apparatus, which stretches the mouth and keeps it wide open at all times becomes so uncomfortable and the patient becomes so morbid until it is practically prohibited. With "fixed" apparatus, proper nourishment is greatly impaired. The greatest of all the contraindications of "fixed" apparatus is the fact that by the tightening of nuts and screws the only force is positive and *intermittent* and does not permit of any muscular action, but rather causes a reaction from muscle spasm.

Removable appliances are hygienic, permit of proper nourishment, afford short intervals of rest, and greatest of all, make possible the use of spring forces which are constant and at the same time allow the muscles to voluntarily exercise but at all times in the direction of continued improvement.

As in Orthopedics and Orthodontia, aside from the problems of comfort to the patient, nourishment, etc., the physical principles of Dynamics are resolved into the question of:

CONSTANT VS INTERMITTENT FORCE.

Bone is the framework of the animal body, the various bones are held in relation to one another by ligaments and attached to the bones are soft tissues, tendons and muscles for their support and which govern their action in causing body movement. In normal development, bones and muscles become stronger from intermittent strains they are subjected to and the effort on the part of Nature to meet all active demands causes increased strength and growth which gradually continues to increase with age and while activity continues, strength is developed according to the amount of strain and the corresponding rest; this extends well into middle life and the bones having become enlarged and more dense by cell multiplication. As an example, by experience it is found that when force is applied on the tissues by apparatus 8 hours during the day for the purpose of stretching them, then the apparatus be removed for 16 hours (remainder of 24 hours) Nature will repair the tissues as much or more in 16 hours as they were softened or absorbed, by the pressure in 8 hours.

In referring to the analogy of these conditions, the athlete becomes more active during certain periods and having corresponding rest; the gymnast grows strong by systematic exercise and rest, as dividing the day into three divisions, 8 hours work, 8 hours sleep and 8 hours relaxation. We know that

by grasping a weight it may be held straight outward with the arm at right angles to the axis of the body, and that as the muscles becomes weary they will gradually relax, the arm will droop and finally rest in the line of gravity by the side.

This is exactly the effect upon contracted scar tissue under the influence of the constant spring force, and it is with the rarest exception that the patient cannot be given from 25 to 35 Mm increased action of the mandible in the average time of thirty days during which period there is no pain, no facial distortion and all of the reasonable comforts expected during treatment whereas, to the contrary, when a vacillating force is applied innumerable physical discom-

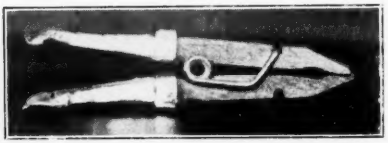


Figure 1.

forts have to be endured, and Nature builds certain resistance from which, when the appliances are removed it is to be seen that no permanent results have been accomplished, altho the patient has paid the maximum price. The positive force of jack-screws for forcing the jaws open indicate a disregard for the patient's comfort, also the physiological principles of tissue changes, the employment of mild but constant spring force possess full regard for all the physical principles in the preservation of the oral cavity, comfort to the patient and is consistent with the laws of the physiological processes in the transition of the cellular construction of the various tissues in the body.

Numerous forms of mechanical apparatus may be successfully employed for stretching and their selection necessarily depends upon the extent in which the mouth may open in the beginning of treatment, the number of teeth present in the upper and lower dental arches and the amount of stress which the patient is capable of standing. It is good principle to always begin very gradually in order to school the tissues to the point of sustaining an effective amount of force without inviting an irritation. If the original efforts are too drastic, the irritation caused is liable to lead into further pathological changes which will either cause a back-set or

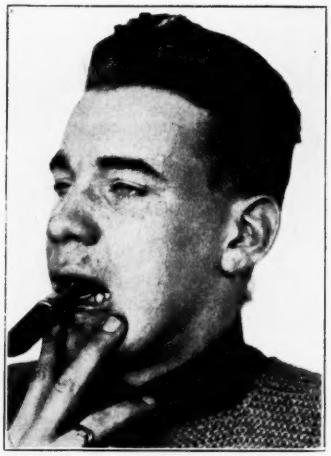


Figure 2.

other complications. The use of the ordinary clothes pin has become to be a proverb in trismus, but it is injurious to the teeth, it is intermittent and is only effective to gain a few Mms. at best.

Figure 1 illustrates a common spring clip clothespin with silver cuffs made with thin tips with sufficient width and concave gutters to rest against the cutting edges of several upper and lower teeth, thereby diffusing the force so as to prevent soreness. These silver cuffs are made by moulding the patterns in dental casting wax to be reproduced in silver by the usual casting methods. These cuffs should be made to fit so that when the clothespin should break

or become weakened, they may be interchangeable.

Figure 2. Clothespin in position. The care of this apparatus may be entrusted to the patient with instructions to be adjusted as many hours during the day as is possible for it to be worn. Aside from the spring value, additional force may be made by pinching the ends of the pin together as much as the patient can stand; this will break up certain adhesions which will then be retained by the spring. This little apparatus affords a mild force for the initial work and will usually be effective in the production of some motion, and in the breaking up of the original resistance following which the response to further treatment becomes much more rapid.

Figure 3.

Figure 3. After the mouth is opened as far as 10 or 12 Mm. and possesses some motion it is well to provide some elastic medium between the teeth against which the patient can exercise the motions of the mandible. There is nothing more effective than a soft rubber block; these blocks may be made from rubber bottle stoppers, and may be vulcanized in suitable sizes of velum rubber, or it is found that the ordinary rubber mouth gags made for use in the administering of gas-oxygen are very effective. This illustration shows a rubber block in the shape of a wedge which has been forced between the upper and lower teeth stretching the mouth as wide open as is possible. The patient upon chewing against this block, causes a regular contraction and relaxation of the muscles which, after contraction, receive the rebound of the rubber which gains permanent results very rapidly.

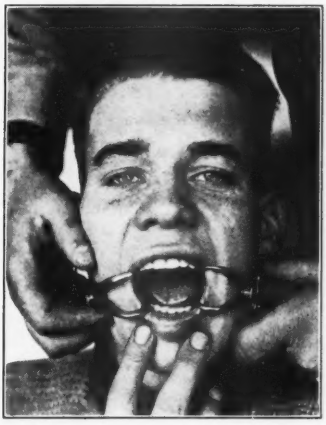


Figure 4.

Figure 4. When a patient is equipped with a corresponding apparatus or rubber block it is indicated to subject the mandible to quite an extensive positive force once per day. This figure illustrates the use of mouth gags placed between both posterior sides of the arches. By tightening these gags all that the patient can stand, there is a certain tearing of tissue fibres which may then be retained by the elastic forces.

Figure 5. After the mouth is opened wide enough to procure models of the upper and lower arches, a regular trismus apparatus should be made which can be worn constantly. These impressions should be taken in modeling composition and poured in some form of

artificial stone and the models mounted on an articulator. With ordinary pink base-plate wax, caps may be moulded over the teeth and reproduced by casting in silver. These caps should fit loosely on the teeth so that they may be easily inserted and removed, and are not to be cemented to position. A piece of 12 G. wire should be threaded and a nut prepared for same, and a piece of square wire of suitable size should be soldered to one end. At the medium line on the upper appliance at a point in a vertical line with the labial surfaces of the lower incisors, a piece of square tubing of about ⅛ in. in depth should be soldered. A

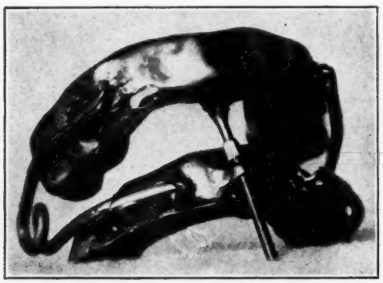


Figure 5.

piece of 12 G. round tubing should be soldered on to the lateral surface of the lower cap at a point directly beneath the square piece of tubing on the upper, and this piece of round tubing should be heavily reenforced. Pieces of 12 G. round tubing about ¾ in. in length are split and bent open into the form of U-tubes and soldered to the posterior sides of the upper and lower caps, respectively, at points opposite the bicuspids. These tubes should be heavily reenforced with solder. At the front ends of these tubes, holes should be drilled so that by bending 12 G. spring German silver wire into the form of a U-shape spring with one spiral curve in the base of the U, the forward ends of the spring may be bent at right angles so as to snap into the holes in the U-tubes which, with the spring resting in the gutters of the tubes, will prevent slipping or dislodgement, at the same time providing an easy means of insertion or removal.

Figure 6. Illustrates the five individual parts of this apparatus. These silver caps should be about 2 Mm. average thickness and the looped springs should be of either 12 G. or 14 G. spring German silver wire.

Figure 7. Apparatus mounted. The patient is instructed in the care of all

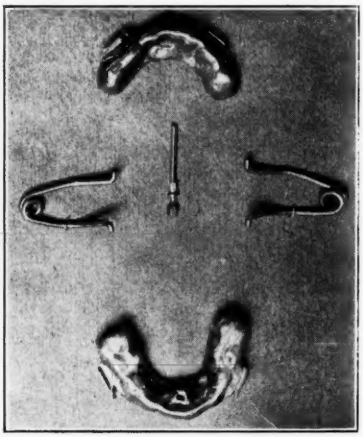


Figure 6.

parts of the appliances and is shown how to remove it before meals, to be cleaned and replaced immediately thereafter. For the rest of the 24 hours in the day the springs are to be kept in position. Once per day the patient reports to the operator and the jack-screw is placed in position by running the nut up on the threads, placing the end thru the round tube on the lower cap, then bringing the square end up into the square tube the nut is tightened into contact with the lower tube, after which it is tightened as much as the patient can stand and allowed to remain for 15 to 30 minutes before the jack-screw is removed, and looped springs are tight-

ened about 2 Cm. wider than the existing space between the upper and lower U-tubes so as to maintain the space gained by the jack-screw, and at the same time to liberate slightly more spring pressure.

Figure 8. When the appliance is removed each day prior to stretching with the jack-screw, an Orthonontic micrometer is placed between the upper and lower incisor cutting edges at a definite point and the record is kept from day to day, so as to note gradual progress. After the jack-screw has been used to stretch the jaws,

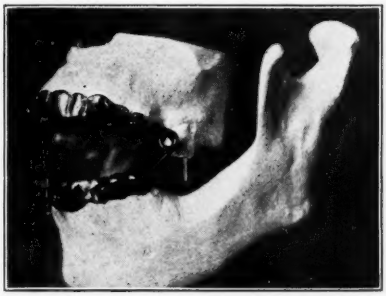


Figure 7.

a second measurement is taken and recorded. The average case will show from 2 Mm. to 4 Mm. improvement per day and the average length of time of treatment of traumatic trismus has usually required about one month. If a greater period than one month is required it is known that some serious mechanical handicap is present which perhaps will require surgical interference. It is estimated that if 32 Mm. in space could be gained between the upper and lower incisor cutting edges that this is ample for all practical purposes. This illustration shows the micrometer used for measurements in position.

TRAUMATIC TRISMUS.—ADHESIONS IN THE MUSCLES OF THE CHEEK.

Figures 9 and 10. Illustrating the point of exit of a H. E. fragment which caused extensive destruction of muscle tissue, severed the lower branches of the seventh nerve, causing partial facial paralysis, extensive infection, and saliva-fistula. The result of healing made the contraction of a very thick, large and dense scar which was adherent to the upper and lower buccal ridges. The first operation performed was to skin inlay the upper and lower buccal sulci, thus liberating the deeper adhesions. The sicatrized area of the cheek was

Figure 8.

placed under massage and negative ionization for the purpose of softening the scar tissue.

Following as much elimination as possible by the above methods, this trismus was treated mechanically with the preliminary clothespin, followed with a rubber block, later attaining 36 Mm. by the use of the regular trismus splint. This work was accomplished from the beginning in nine weeks of treatment which was considered good progress in view of the original conditions.

ADHESIONS IN THE TEMPORAL MUSCLE.

Figure 11. Illustrating a wound from a H. E. fragment which fractured the

zygoma, Coronoid process, which was driven into the zygomatic fossa. Frag-

Figure 9.

ment was excised and it was impossible to replace the comminuted fragments of

Figure 10.

the bones with the result that when they healed there was a state of mal-solidification between them, all of which was enveloped in scar tissue and the remains of a tendonous attachment of the temporal muscle. It was impossible for this patient to open the mouth, whereupon a circular flap was turned downward exposing the region of the zygomatic fossa, the pieces of bone excised, the temporal muscle incised until the mandible was freely manipulable.

Figure 12. Illustrating the combination spring and jack-screw trismus apparatus made previously and inserted at

Figure 11.

the time of the operation which prevented the possibility of reunion. The continued wearing of this apparatus has produced 24 Mm. of permanently acquired space and further success is assured. This was an extremely difficult case and although treatment has covered a period of about three months it is believed that remarkable results are being obtained. The patient has had mouth placed in perfect condition, dentures fitted and is able to enjoy improved appearance and mastication. The trismus apparatus is worn at night only and will be given to the patient to be kept permanently for use when required.

Figures 13 and 14. Trismus of the temporal muscle, a similar case to that

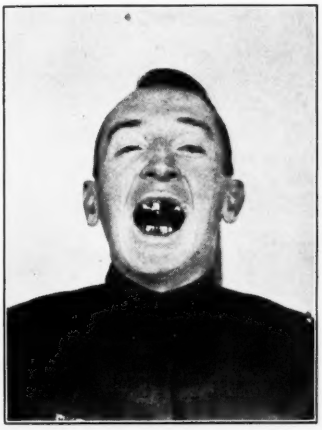


Figure 12.

described above, which underwent the same treatment.

Figure 13.

Figure 15. Completed results after six weeks' treatment, 32 Mm. space obtained.

ADHESIONS IN MASSETER MUSCLE.

Figure 16. Illustrating the case wherein it was impossible to open the mouth as the result of a trismus in the left masseter muscle.

Figure 17. Radiograph demonstrating myositis ossificans of the masseter. The small shell fragment is seen in the region of the ramus, entered the face over the malar process and traversed the masseter muscle only. It is evident that the osteoblastic activity, caused by the rupture of the periosteum at the points

Figure 14.

of original insertion of this muscle, caused an initial stimulus for the resultant proliferation of bone cells and the ultimate resolution of the muscle fibres. This muscle was excised by means of a circular flap incision thru the skin in the neck and elevated over the ramus; by blunt dissection the surrounding tissues were elevated and the muscle removed.

Figure 18. Trismus apparatus adjusted after operation.

Figure 19. Completed result.

ADHESIONS IN THE INTERNAL PTERYGOID MUSCLE.

Figure 20. Illustrating point of entrance H. E. fragment which passed thru

the malar process entering the internal pterygoid muscle, made its exit thru the walls of the pharynx from whence it

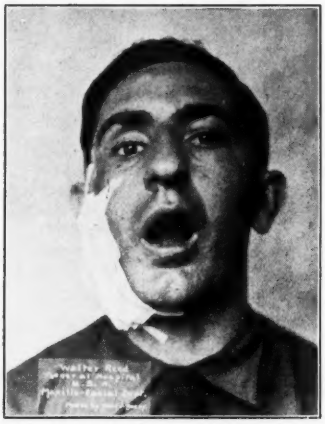


Figure 15.

extruded and was removed at a Regimental Aid Station. Upon healing, the

Figure 16.

patient noticed that the mandible was gradually closing until from the date of injury, Oct. 9, 1918, to June 16, 1919, his mouth gradually closed. An atero-

posterior radiograph revealed an excessive density in the region of the right internal pterygoid muscle which was in-

Figure 17.

cised thru the post-molar triangle and approximately the middle third of the

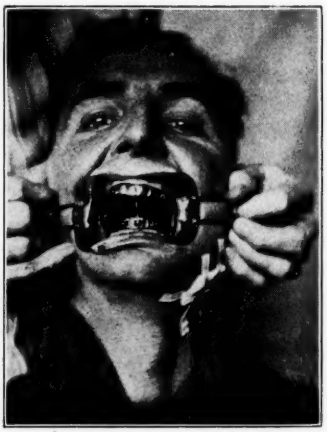


Figure 18.

muscle removed, following which the complication of trismus was readily treated.

Figure 21. Illustration of trismus

apparatus in position which attained 36 Mm. space.

The above illustrations demonstrate

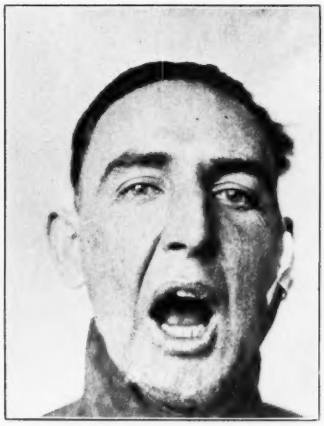


Figure 19.

something of the range of adhesions causing trismus. The cases shown are

Figure 20.

among the worst of a variety of about 35 cases treated in this hospital as the result of maxillo-facial injuries all of which have been satisfactorily cured by the use of the mechanical apparatus described.

Capistratus Trismus. This form of trismus is described as that which results from adhesions caused by ulceration in or around the maxillo-facial area.

Figures 22 and 23. Illustrates an extensive sicatrized area in the left cheek from an ulcer of obscure origin which developed simultaneously with a severe typhoid infection. This ulcer may be of matastatic origin, this being a favor-

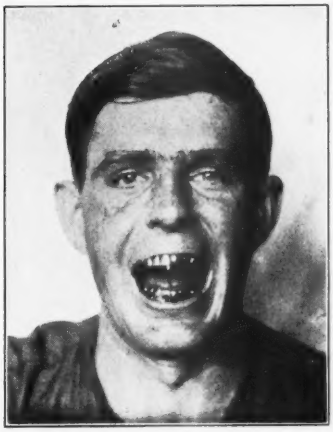


Figure 21.

able region in the cheek tissues for the presentation of matastatic abscess. This infection perforated the buccal mucosa and obliterated the upper and lower buccal sulci. The first operation in this case was to incise the sulci and line them with epithelium, the usual process of skin inlay. After healing was effected intra-orally, impressions were taken and the regular trismus splint constructed.

Figure 24. Operation local anesthetic, scar tissue in check excised, adjacent skin extensively undermined thru the subcutaneous fascia, edges drawn to gether and sutured. Following healing, trismus apparatus was placed in posi-

tion, massage and ionization applied, with complete cure.

TRISMUS OF CEREBRAL ORIGIN.

Figures 25 and 26. Present for consideration, photographs of a case of trismus which is most interesting in the study of the probable origin and in its diagnosis. This patient was born in Italy, and having moved to the United States was inducted into the army. He speaks very little English and it is exceedingly difficult for him to understand or make himself understood. His temperament is characteristically very genial around his friends, he also possesses a trait of being very cautious among strangers, a condition apparently built up within him owing to his inability to converse freely. He has a record of having been a hard fighting soldier in the field and sustained a wound which necessitated an amputation thru his right thigh. The stump healed and he manipulates a well-adjusted artificial limb with satisfaction, and shortly after the completion of this work was presented to Walter Reed General Hospital for the treatment of his jaw condition.

Figure 22.

The history of his jaw verifies the fact that there has been no traumatic injury of even the slightest degree. The symptoms presented are an insidiously increasing unilateral prognathism of the mandible until the extreme right was reached. His condition developed very

Figure 23.

Figure 24.

gradual, but apparently without his control. Shortly afterwards, intense soreness was noticed in the left zygomatic fossa and the muscles of mastication became spastic and irritated on both sides. Radiographic surveys were made of his head and teeth, his sinuses were clear, and he had no dento-alveolar infections, no anomylies or any other possible sources of local irritation. Wasserman tests proved negative. Numerous officers in various departments have pronounced that the original inception of this condition must be of pyschic origin, and following its onset, other complications resulted as a natural sequence. It is also possible that the establishment of this condition is due to some habit which he formed in forcing his jaw forward as in the endurance of pain, etc. Apparatus was adjusted to the upper and lower arches with hooks applied for unilateral intermaxillary equalizing rubbers. This apparatus proved ineffective and it seemed that the mandible voluntarily resisted, which occasioned even greater soreness in the muscles than had been experienced hitherto. Following this, and inasmuch as rest was determined to be the first essential, the mandible was secured to the superior maxilla by means of intermaxillary wiring. It required such force to shift the mandible into normal occlusion until the intermaxillary wires also proved to be ineffective. Finally a cast silver encapping splint was made to fit the lower arch with a heavy buccal flange attached to the left molar region which fitted against the buccal surfaces of the upper molars. This enabled the patient to open the mouth, but rendered it impossible for the mandible to drift towards the right. This apparatus controlled the median line, placed all teeth in normal occlusion, and equalized tension in the muscles of mastication inducing sufficient rest and normal pose until, after several weeks, the soreness disappeared, the muscles relaxed and the treatment on the basis of normal position and rest proved effective.

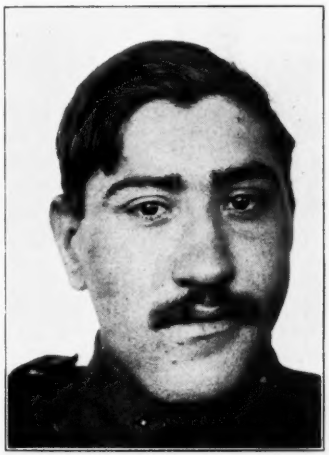


Figure 25.

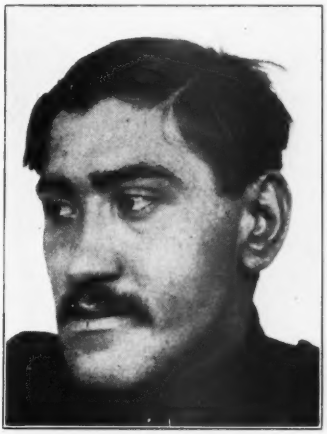


Figure 26.

SURGICAL TECHNIC OF APICOECTOMY.

By Chalmers J. Lyons, D. D. Sc., Ann Arbor, Mich.

(Read before the National Dental Association at Its Twenty-third Annual Session, New Orleans, La., October 20-24, 1919.)

DURING the past decade much has been written relative to the treatment and eradication of those morbid conditions about the apical ends of tooth roots caused by devitalization of the dental pulp. Until within recent years only a few operators have attempted the eradication of these morbid conditions by excising the ends of the roots, and curetting out the diseased area. As early as 1884 (1) Farrar saw the practicability of such an operation and described the technic, but it has only been within recent years that the procedure of root resection has taken a place of prominence in the practice of operative dentistry. Perhaps one of the reasons that this operation has become an important one in the field of operative dentistry is on account of the fact that dentistry has come to realize the necessity for the elimination of mouth infection. It must be clear to all of us that when there is disease and death of the pericemental membrane in the apical area, our present therapeutic measures will not suffice to put that region of the mouth in the best possible condition for the future welfare of the patient.

If this be true, then it must be obvious that in the treatment of this class of cases, surgical procedure must be the one to which we will have to resort, if the infection is to be eliminated. The surgical procedure can be accomplished in one of two ways: first, by extraction of the tooth followed by a thoro curettage; or, second, by opening thru the muco periosteum and the alveolar process in the immediate neighborhood of the diseased area, resect the diseased root end and curette out of the diseased area.

It is a regrettable fact that some men are resorting to root resection for the purpose of clearing up an infection around the apical area over a beautiful crown or a masterpiece of bridge-work, without first eliminating the source of infection. Root resection, or apicoectomy, cannot be successful unless the root-canal and dental tubuli have been sterilized and the root-canal properly filled previous to the operation.

Thoma in his book on "Oral Abscesses" states that "if it is not worth while to remove a crown and treat the root-canal, the tooth should be extracted or there will be a recurrence of the infection and the patient will be as bad off as before. It is not justifiable to leave a crown on a tooth because it is a masterpiece of art, if the foundation upon which it is built ruins the patient's health."

The foundation then, upon which the success or failure of this operation rests, is the condition of the root-canal and tubuli. The manner of the preparation of these has been beautifully taken care of in Dr. Hartzell's paper in this symposium.

Assuming now that the root-canals and dental tubuli have been sterilized and the root-canals properly filled, what is the modus operandi of apicoectomy?

In the first place, this operation con-

sists of invading the soft tissues as well as the alveolar process, and a recognition of the difference between surgical and dental cleanliness must be made. If this operation is to take a place in conservative practice, the same surgical asepsis must be maintained not only in the field of operation, but with the operator as well, as would be necessary in any surgical work in the same or a similar field. It should not be necessary before a meeting of educated dentists today to go into the details of how surgical asepsis should be maintained.

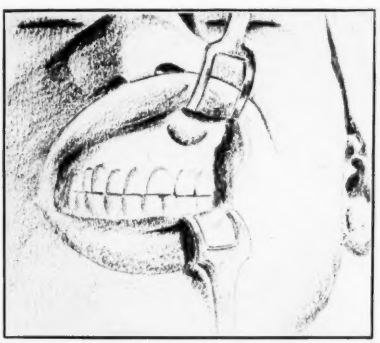


Figure 1.

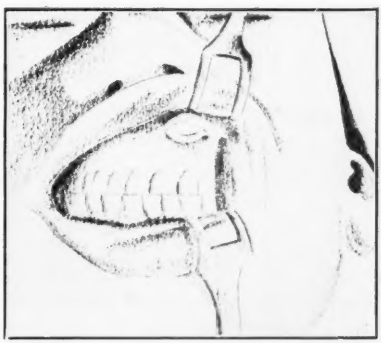


Figure 2.

It seems to be conceded that local anesthesia, either conduction or infiltration, is the anesthetic of choice for this operation on account of having the cooperation of the patient and of being able to control the hemorrhage which are factors not to be ignored. Clinical experience has demonstrated that an isotonic anesthetic solution, if properly used, does not interfere with the process of repair.

After the field has been anesthetized, the first step in the operation is to remove the gross sepsis from the field of operation. This is accomplished by the use of alcohol to dry the surface over the field of operation, followed by swabbing with 7% tincture of iodine.

A curved incision is then made over the point where the tooth is to be resected, about two cm in length with the convexity toward the cervical line (Figure 1). The incision should be made thru the muco periosteum to the alveolar plate. The muco periosteum is then raised up by blunt periosteal elevators to form a muco periosteal flap (Figure 2). By so doing, the outer plate of the alveolar process over the infected area is exposed. In some cases the outer plate will have become disintegrated so that the raising up of the periosteal flap will expose the apical end of the tooth root. In other cases, when the outer plate of the alveolar process is intact, the apical end of the tooth root is exposed by the use of sharp hand chisels (Figure 3) using them to cut away the outer plate until the root end is exposed. The writer prefers the chisels for exposing the root end on account of the ability to preserve the land marks during the entire operation, with the cutting of the outer place away which the engine burr might destroy.

A sufficient area of the outer plate should be removed so that the infected crypt and the apical end of the tooth root is exposed (Figure 4). The resection of the apical end of the root is made at the floor of the crypt and the

root of the tooth is cut down to healthy tissue (Figure 6).

The writer has found the Henahan surgical drill, No. 4, a very efficient instrument for the purpose of resecting the root. (Figure 7). The resected end is now lifted out of the crypt and the pocket thoroly curetted with spoon-shaped bone curettes. A large round bur is next used to smooth off the sharp edges of the alveolar plate and to cut the end of the root and base of the crypt down to healthy tissue. The cavity and root end is then polished with a gold finishing bur. The writer prefers the gold finishing burs to stones for this purpose on account of the possibility of the deposition of foreign matter from the stones which would interfere with the process of repair.

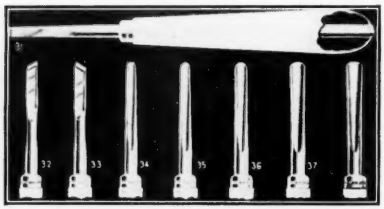


Figure 3.

We should now have a wound that is free from infection and the tissues around it healthy. In any other part of the body such a wound would not be considered serious and repair would usually take place by first intention without untoward symptoms. So will it here. The writer, however, has felt that the vulnerable point in the whole operation of root resection has not been in getting repair by first intention, but in leaving the end of the root of the tooth exposed, making it susceptible to future resorption.

Many schemes have been resorted to in the past to procure a protection for the exposed root end. (2) Amalgam has been used with more or less success. Encapsulation with gutta-percha has been used; filling the apical end of the canal with gold has been tried; filling the whole canal with lead canal points and after resecting, burnishing the lead over the end has been practiced. All of these methods seemed to have met with objections. None seems to have accomplished the full requirement of completely sealing over the exposed root end.

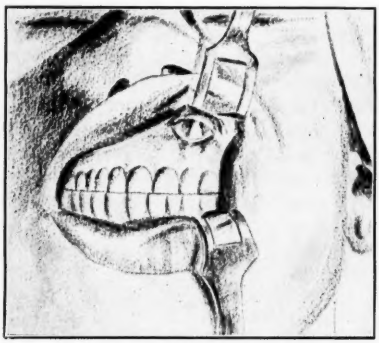


Figure 4.

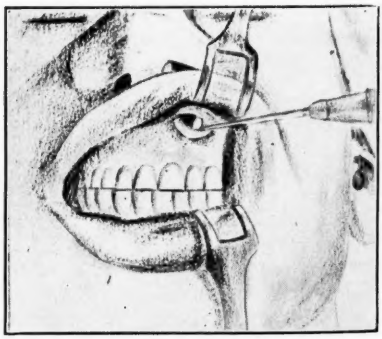


Figure 5.

For the past year, in the clinics at the University of Michigan, we have been reducing silver over the exposed ends and, with the present evidence at hand,

it seems to meet the requirements of completely sealing over the end of the root and it does not seem to interfere in any way with the process of repair. This was first brought to our attention by (3) Dr. Percy Howe, altho the method of reducing the silver is somewhat different. (4) Dr. U. G. Rickert, of the University of Michigan has been cooperating with the writer in the attempt to seal over the ends of the resected roots and he has worked out the following method for the purpose.

The resected ends are sealed with rapid reducing silver, made up as follows: to a 10% or 15% solution of agno3, enough KoH or NaoH is added to convert all the silver to the oxide. The oxide is carefully washed with distilled water and placed into an amber-colored bottle for future use. When not in use the silver oxide should be kept in a dark place to prevent reduction.

When rapid reducing silver is desired, the oxide is carried with a glass rod into a drop or two of pure NH3OH until the fumes of ammonia are no longer noticeable. This silver ammonium oxide solution is amber colored. It is applied by suitable glass pipettes to the dry resected end of the tooth. It is left there for from three to five minutes, after which a small amount of some reducing agent as eugenol or a 2% solution of formalin is added and left for one minute. The excess is removed and the resected end is burnished with a warm burnisher. The treatment may be repeated until there is a dense black layer of silver deposited over the root end.

All the unused silver ammonium oxide should be discarded immediately after use, because of the possibility of forming the explosive fulminates of silver.

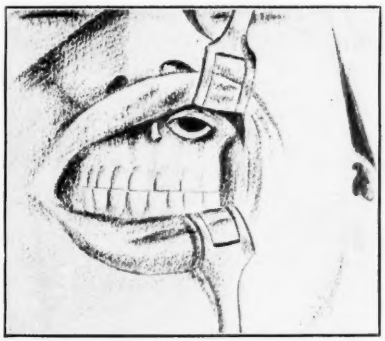


Figure 6.

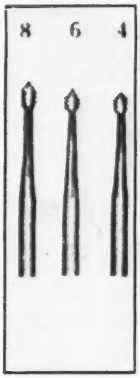


Figure 7.

After the process of reducing silver over the exposed end of the root is completed, the next question to decide upon is, whether it is better to bring the edges of the flaps together and suture, or to pack the wound and let the process of repair take place by granulation. For some time the writer was prejudiced against suturing these wounds, but clinical experience has shown that when the crypt has not been too extensive, repair has taken place more rapidly and with less pain when the wound has been sutured than when left open (Figure 8.) Horse hair or "B & B" dermal suture seems to be preferable to other materials for this purpose (Figure 9). Twenty per cent solution argyrol used as a spray

over the wound immediately afterward and every 24 hours following seems to yield good results.

In extensive cases when it is deemed best not to close the wound, but to depend upon granulation for repair, iodoform gauze packed lightly into the crypt for 24 to 48 hours and then removed and the wound irrigated every 24 hours thereafter with 5% salt solution until repair is complete, has been the treatment that has been followed out in the writer's clinics.

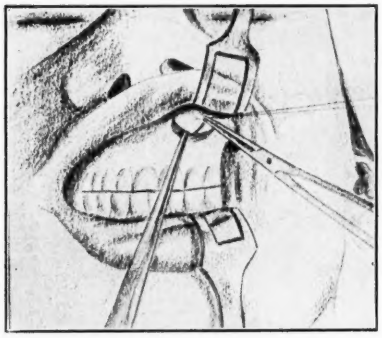


Figure 8.

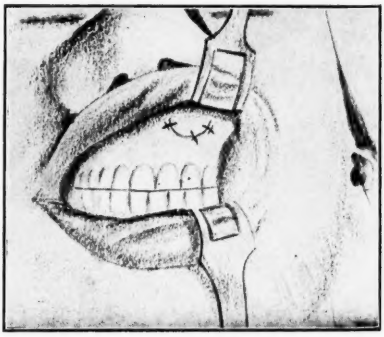


Figure 9.

In checking up with the roentgenogram following the operation of root resection, the fact must not be overlooked that the roentgenogram is merely the shadow of conditions present. In some cases it is not at all probable that the regeneration of the new tissue will have the same density as the original, consequently there may for sometime be a difference in the density of the shadow and to the unexperienced may be misleading.

If this operation is to take its place in conservative dental practice, the diagnosis of the case will play a greater role in the success or failure than will the technic of the operation. In the final analysis, methods of procedure in the operation play only a small part; the methods which are successful in one man's practice might be a failure in another's.

After all, the final results are the determining factors. As the writer sees it, there are four cardinal points to keep in mind: first, a correct diagnosis of the case; second, recognition and maintaining surgical asepsis; third, eradication of the infection; fourth, completely sealing the end of the exposed root.

If these principles are carried out in every case, the results will take care of themselves.

Bibliography.

1. Radical and Heroic Treatment of Alveolar Abscess by Amputation of Roots of Teeth. Dental Cosmos, March, 1884. Farrar.

2. Technic of Root Resection. Jr. N. D. A., Sept., 1919. Lucas.

3. A Method of Sterilizing and at the Same Time Impregnating with a metal, Affected Dentinal Tissue. Dental Cosmos, Sept., 1917. Howe.

4. Advantages and Disadvantages of Reduced Silver in Dental Therapeutics. Jr. N. D. A., Oct., 1919. Rickert.

APICOECTOMY—ITS INDICATIONS AND CONTRA-INDICATIONS AND ROOT-CANAL TECHNIC.

By Thomas B. Hartzell, M. D., D. M. D., Minneapolis, Minn.

(Read before the National Dental Association at Its Twenty-third Annual Session, New Orleans, La., October 20-24, 1919.)

APICOECTOMY has been practiced more or less successfully for many years. Ten years ago, the author of this paper published a short article in which he gave a review of three hundred and fifty cases, which series of cases showed a loss of thirty-five by extraction in three years. Prior to the present knowledge of the dangerous character of the apical granulomata, apicoectomy was considered a sane and reasonable operation indicated wherever discomfort resulted from the presence of abscesses or granulomatous masses. The usual method of procedure was to make a clean incision over the apical third of the tooth root, drill, chisel, or trephine, and curette out the root tip and abscess sack. Many of these were allowed to heal at once, but the technic followed by the author was to load the tip of a tampon of cotton with iodine and the base of the tampon with sandarac varnish and place it into the cavity left by the removal of the root tip and abscess material. This was replaced from time to time until the opening filled with granulation tissue from the bottom outward. At the time this short paper was written, our only requirement was that the overlying tissues be normal in appearance and that the tooth in question be a comfortable masticating organ.

That this operation successfully preserved teeth for further masticatory use was undoubtedly true. The author has under his care at the present time, a great many patients with teeth of which root tips were amputated fifteen years ago, and these same teeth are doing useful service as masticating organs at the present time.

As local anesthesia was perfected, apicoectomy became more and more common, and Ottesen of Christiania and Fisher of Marburg made trips over the United States, each teaching the technic more or less successfully used by them in this operation. As a result, many men became advocates of the operation who formerly resorted to extraction or root-canal treatment only for the cure of root end infections. Local anesthesia having made apicoectomy a painless operation, the natural result has been that it is frequently practiced where it is contraindicated with a resultant loss of the tooth operated upon, or, what is still worse, the planting of secondary infection in the blood stream of the individual in whose mouth the diseased tooth is left. It, therefore, becomes a matter of supreme importance to understand clearly the indications and contra-indications for the successful practice of apicoectomy.

Let us consider first the general health of the individual for whom apicoectomy is intended to be practised. First of all, he should present absolute normality in every respect. His blood stream should run a normal number of erythrocytes and leucocytes and he should possess a normal haemoglobin. His energy should be plus and his heart sound as well as his kidney, with no sugar, casts, or albumen existing in his urine. No other type of infection should be present in his body. For in-

stance, a person who is suffering coincidentally from tuberculosis should never be permitted to undergo apicoectomy. This same rule applies to one who is suffering from a rheumatic condition or gastro-intestinal infection.

If a patient does not present any of the foregoing conditions, apicoectomy might be considered, providing the tissues investing the tooth to be operated upon are in perfect health. There should be no gingivitis or pyorrhea. The reason for this requirement is clearly shown by the work of Doctor K. R. Collins,[1] in which piece of research she conclusively shows that the pulps of teeth affected with pyorrhea were one-half infected, and that teeth with sound crown and sound mucous membrane were practically sterile, pointing clearly to the fact that the presence of bacteria in the investing tissues of teeth is not only a direct menace to the pulp (explaining a large proportion of our pulpitis) but also showing to the thinking mind that apicoectomy must be contraindicated where the gingival tissues are broken. The tissues surrounding the apex of a devitalized tooth have not the high resistance of the perfectly normal tissues in which the circulatory mechanism has never been damaged. This fact has been pointed out by Ulrich[2] and others. Subsequent work of Henrici and Hartzell[3] on this same problem confirms Collins' observations and must be added to the general argument that the tooth with a diseased gingival crevice is a very bad risk for operation. They have also found that tooth pulps and the apical tissues of teeth affected with pyorrhea show 43% of infected tooth pulps. Therefore, such teeth when damaged by apical infection should be extracted rather than submitted to the surgery of apicoectomy, because of their liability to reinfect the investing tissues of the tooth.

Apicoectomy is indicated where the patient is in a good physical condition and the tissues surrounding the abscessed tooth are free from gingivitis and pyorrhea, and the root-canal and dentin of the root in question is sterile. The method most successfully used by the author to attain sterility is briefly as follows:

Remove all debris from the root-canal and introduce into it sodium and potassium in sufficient amount to clearly bleach it, dissolving out all of the oily and fatty material present in the structure of the dentin at the same time destroying the bacteria therein. Later wash with peroxide of hydrogen and dry, after which introduce into the canal enough chemically pure sulphuric acid to fill it. Allow this acid to remain in the canal for five minutes. Then dry with sterile cotton points and fill at once by the Callahan method. The opening should then be filled with a strong cement and root amputation should take place at once. In view of the fact that successful root-canal fillings require thoro condensation, one is justified in using heavy hand pressure in order to completely fill the canal. Some of this root-canal filling will ooze thru the root end and therefore it is always better to amputate immediately, relieving the apical tissues of pressure and saving the patient pain.

Thus we see in closing our argument, that indications for apicoectomy are absolute normality of body,—normal blood picture, normal kidney, normal heart and lungs, as well as a healthy gastro-intestinal tract, to which requirements should be added, absolute sterility of the tooth to be operated upon and a healthy gingival crevice. Contra-indications for root tip amputation are—general infection of the body of any sort such as, heart or kidney dis-

[1]The Journal of the National Dental Association, Volume VI, Number IV, Pages 370-373.

[2]Dental Review, 1914, December number.

[3]Unpublished. (Read at recent meeting of N. D. A., 1919.)

ease, anemia, tuberculosis, rheumatism, neuritis, unsterile root tissues and a diseased gingival crevice. Apicoectomy certainly has a field in dentistry. If, however, the suggestions contained in this paper are to be a guide to action, the number of apicoectomies will be greatly lessened.

DISCUSSION.

Thomas P. Hinman, Atlanta, Ga.
Discussion on Dr. Hartzell's Paper.

It is very difficult to discuss a paper of this type because my views coincide perfectly with the text of the paper,—or rather that part of the paper that deals with indications and contraindications. The operation of apicoectomy, if indiscriminately practiced, is sure to lead to disaster and its limitations, as outlined by this paper, if followed, will bring apicoectomy into its proper relation to other methods of focal eradication. Where as much as one-third of the root is involved in a granulomatous area, under no condition should this operation be attempted.

I think it has been clearly proven that it is practically impossible to sterilize large areas of dentin—or rather dentin to any considerable depth. It has also been clearly shown that dentin is infected to a considerable depth. (By Grieves.) In making amputations of large or root apices, dentin would be left in contact with the wound and reinfection from such dentin extremely liable.

The crux of the whole situation is indicated in the paragraph of this paper which says:

"Apicoectomy is indicated when the patient is in a good physical condition and the tissues surrounding the abscessed tooth are free from gingivitis and pyorrhea and the root-canal and the dentin of the root in question is sterile."

The great question is: Can we produce absolute sterility in infected dentin? If this can be successfully proven, it will, to a considerable extent, improve the chances for successful apicoectomy. The method of sterilizing the root-canal, as indicated by the author, is certainly successful insofar as the root-canal is concerned, but proof is not submitted to what depth into the dentin that sterility is obtained. Certainly chemically pure sulphuric acid will sterilize any substance with which it comes in contact. However, it must be noted that the action of sulphuric acid on dentin will produce calcium sulphate. This makes sulphuric acid self limiting because calcium sulphate is not soluble in sulphuric acid. However, I have no better method of producing sterility than the one indicated by the author.

Thomas P. Hinman.
Discussion on Dr. Lyons' Paper.

This extremely interesting paper records the history of apicoectomy as a method of eradicating incurably abscessed teeth as practiced by the early operators, and also as a later method of eradicating focal infection. Therefore, it is unusually interesting from this standpoint.

The surgical technic, as indicated in this paper, is certainly admirable and I am glad to see that the author has adopted the technic of immediate closure of such wounds. One of the greatest causes of failure in this operation is due, first, to a too general application of the operation without a careful survey of the general physical condition of the patient, as indicated in Dr. Hartzell's paper, which is a part of this symposium. Again, another fruitful source of failure is the lack of application of proper surgical principles, as well as the lack of surgical cleanliness by so many operators.

I note the author still follows the technic of a curved incision. My personal preference is for the trap-door incision, made large enough that when the muco-periosteum is deflected, the field of operation is more readily visible and accessible. The use of the bur in

removing the outer alveolar plate is certainly contraindicated and the use of the chisel, as shown by the author, is certainly far preferable.

The complete enucleation of the excised root ends with the sac adherent is far preferable to curettage previous to excision. Endeavor should always be made to leave the sac intact and remove it en masse where possible. The sac if infected and if it is broken and the contents spilled in the field of operation, or small parts of tissue left in the operated area, the chances of reinfection are certainly multiplied. Curettage, as indicated by the author, should be done to a depth where healthy tissue is noted. The thoroness of the curettage has a great bearing on the final success of the operation.

The silver-deposit method, as indicated by the author, to be used on the amputated root ends is certainly worth our consideration, and if the silver can be re-deposited in the dental tubuli and the roots ends left perfectly smooth, it will remove one of the most serious objections to this operation,—i. e.—re-infection from infected dentin.

In my judgment, where the area of destroyed bone is sufficient to require packing after apicoectomy, it is far better to remove the tooth than to attempt this operation.

The result of the deposit of silver in the dentin over the root ends will be watched with a great deal of interest by the profession I am sure, for one of the main objections to this operation has been that the dentin which comes in contact with the soft tissues after apicoectomy is very likely to be infected and, therefore, produce re-infection in the wound. In cases where the root end does not extend very deep into the granulating area, it has been my practice not to attempt apicoectomy, but to enucleate the granuloma and smooth the root ends with fine burs and files, leaving cementum in contact with the soft tissues instead of the dentin with its many open tubuli. I am watching this procedure with a great deal of interest and may, some day see fit to make a report on it. The author is to be congratulated on his clear statements and the excellence of his surgical procedure.

William L. Shearer, Omaha, Nebr.
Discussion on Dr. Hartzell's Paper.

Dr. Hartzell should receive the hearty approval of all for his conservative statements relative to indications and contra-indications for Apicoectomy, also technic preparation.

The complete construction of his paper dealing with this subject indicates beyond the question of a doubt, intensive study and convinces one of the seriousness of the consequences following in the wake of mouth pathology.

In fact, he is so thoroly conservative that it permits of but little discussion and leaves no room for criticism.

With the recent intensive study of focal infection in which the roll of an apical abscess has been accurately demonstrated in its relation to systemic manifestation of disease, this operation must be viewed in a somewhat different light than heretofore.

Requirements previously have been, with abscessed teeth, relief from pain and the preservation of teeth for further masticatory use.

Apicoectomy, perhaps, fulfills this requirement better than any other surgical procedure introduced.

Dr. Hartzell emphasized this fact when he said: "Indications require that the patient should present absolute normality, physically, in every respect." The question then naturally arises, "How are we to determine whether our patient is absolutely normal or not?"

It is obvious that none of us, at least the majority, are content to pass judgment from whatever examination we might make, and a competent internist is necessary.

This is an idea which I have advo-

cated for many years, and I have had the pleasure and benefit of such an association.

It would seem that two fundamental questions should enter into the estimating the patient's normality.

1. Has he a normal quantum of available energy to supply the demand of his usual activities in work or pleasure?

The measure should be the patient's optimum state of health.

2. Does the patient enjoy a satisfactory state of well being? In other words, is he happy in his state of health?

His optimum state of well being should be the measure.

If the above postulates are fulfilled, the doctor and his patient *may* be justified in permitting the existence of focal infection in the exchange for mechanical advantage. In other words, we will allow the patient to carry a superfluous load if he carries it lightly. Whenever he shows symptoms of fatigue or disturbed function, which in any way may be attributable to focal infection, the load should be removed.

Of course we must make certain mental reservations as to the possible definitive bearing, altho, yet unproven of focal infection in apparently healthy individuals, on cardio vascular-renal disease and the aging process.

William L. Shearer, Omaha, Nebr.
Discussion of Dr. Lyons' Paper.

The surgical technic of apicoectomy, has been so comprehensively treated by Dr. Lyons that it leaves no criticism from the standpoint of surgical technic.

A noted surgeon once said to me, "The only feasible excuse for the existence of a doctor is a patient." With this thought in mind, the postoperative findings should, in my judgment, receive a great deal more consideration than has been outlined in this paper.

Can we use the phrase, "if the infection is to be eradicated," without considering most thoughtfully the future history of the infected apical area, and future well being of the individual for whom apicoectomy has been performed, without advising him of the percentage of failures, not surgical, but from a pathological viewpoint?

We all know, in the face of the most careful preoperative therapeutic treatment and surgical technic, that many are failures from the point of future infection. Is it not in the majority of cases a so-called temporarily sterilized morbid process?

If the surgeon is certain in his mind of the permanent eradication of disease, I should say, process without fear. If, on the contrary, there is a doubt in his mind, should not the patient be advised of the doubt, and at least be permitted in a measure to decide the future action, as it may concern his ultimate state of well being?

In one paragraph the essayist says, "assuming now that the root-canals and dental tubuli have been sterilized and the root-canals properly filled." It is this assumption which should be conveyed to the one for whom operation is contemplated.

In conclusion, while the essayist has not covered these few thoughts in his paper, I am sure he considers them in his every-day practice.

Carl D. Lucas, Indianapolis, Ind.
Discussion on Drs. Lyons' and Hartzell's Papers.

I have notated just a few points which I wish to emphasize. In the first place, the author of the first paper said that in those cases where we contemplate doing root resections we must operate upon patients who are absolutely normal physically, taking into consideration the normal number of erythrocytes and leucocytes in the blood, etc. Second, these patients must have absolutely normal conditions of heart, kidneys, and perfectly healthy gingival tissues. In my opinion, these patients are extremely in the minority (applause). If we must not consider this operation for a patient who has a general subacute infection indicated by the sequela of

heart lesions, kidney lesions, or joint lesions, our field, it seems to me, is quite limited.

In the surgical treatment, as indicated by Dr. Lyons, the first and most important thing which he emphasized was diagnosis: second, surgical cleanliness; third, the sealing of the tubuli after the root end has been resected.

Diagnosis is certainly a very important point in any operation. A large percentage of failures in this operation is due to the fact that we have not been able to make correct diagnoses.

The mistakes in diagnoses made from roentgenograms are chiefly due to the fact that we cannot project the rays so we can demonstrate perforations on the labial or lingual side of anterior tooth roots. I understand, however, that some one has perfected a technic for making films so we can make such diagnoses in a practically positive manner. I am very careful to say "practically positive," because the time in the dental profession, especially in this branch of the dental profession, when we are doing things "*perfectly*" has not yet arrived.

A point which I wish to emphasize at all times is the importance of surgical technic. The dental profession will be compelled to realize in the near future that dental or oral surgery is "*surgery*," therefore, must be done according to the rules of surgical technic.

Another point which I wish to mention at this time is that it is not only necessary to remove the granuloma from the infected crypt, but also to remove the circumferentially infected, sclerotic bone which immediately surrounds the granuloma. I have had my bacteriologist make cultures of this sclerotic layer of bone which immediately surrounds the granuloma, and we find the same micro-organisms in positive cultures from this sclerotic layer of bone that we find in inoculations of cultures from the granuloma, therefore, I contend it is necessary not only to remove the granuloma and infected root end, but also the layer of sclerotic bone which immediately surrounds the granuloma, for the purpose of mechanically removing all the grossly infected tissue possible.

After the removal of the sclerotic layer of bone the osteoblasts which are located in the cancellous structure of the bone are liberated. These osteoblasts will be deposited in the antiseptic blood clot. Fibroblasts from the endothelial cells of the capillaries will produce an embryonic fibrous matrix which finally develops into an adult connective tissue matrix for the osteoblasts, thereby providing better environment for a more rapid deposition of bone in the crypt.

I like Dr. Lyons' method of reducing silver upon the remaining root end. But when eugenol is added to silver ammonium nitrate a non-germicidal precipitate of metalic silver is deposited upon the remaining root end. If this metallic precipitate of silver were a germicide the method might be ideal, but if a metallic precipitate be deposited, you will only mechanically seal the tubuli with metallic silver. I am a little doubtful about even the antiseptic properties of the precipitate and absolutely doubtful about the germicidal properties of the metallic silver, which is thus precipitated.

It is necessary in this operation to keep the crypt free from debris and finally and ultimately to have the crypt absolutely free from debris before closing the wound. It may be preferable, and I think it is, to close these crypts where the original granulum was not sufficiently large to have denuded more than one-third of the root apex. If the crypt was sufficiently large to have denuded more than one-third of the root apex, then "do not perform the operation."

From the results which we see in practice I have not quite reconciled my mind to the operation. *In a certain percentage of cases* the more I see of this operation, the more I think of the tooth forceps.

C. J. Grieves, Baltimore, Md.
Discussion on Drs. Hartzell's and Lyons' Papers.

I am not a surgeon but have witnessed the technic and postoperative results of much surgery. I shall, therefore, consider these excellent and most timely papers from that standpoint.

What we need on this subject, to quote President Wilson, is "light, not heat;" "more light" on the postoperative pathohistology; and less "heat," in the enthusiasm with which this operation is done and heralded as a cure for subapical and general disease.

I, therefore, applaud and accent Dr. Lyons' statement, "That if this operation is to take its place in conservative dental practice, the diagnosis of the case will play a greater role in the success or failure, than will the technic of the operation." Also, I heartily second Dr. Hartzell's warning that it may eventually "result in, not only the loss of the operated tooth, or what is still worse, the planting of secondary infection in the blood stream of the individual in whose mouth the diseased tooth is left."

Dr. Hartzell's axiom that, "There should be no gingivitis or pyorrhea," and Dr. Lyons' strictures against this operation—"over a beautiful crown or a masterpiece of bridge-work, without first eliminating the source of infection, the root-canal and dental tubuli of which have not been sterilized"—are both in keeping with their beautiful surgical technic. But how are we to sterilize apical dentin and cementum via the root-canal? And then, how are we to know it is sterile thruout?

Dr. Lyons does not say: Dr. Hartzell uses, first, sodium and potassium; second, hydrogen peroxide, and, third, pure sulphuric acid. I am not aware that these remedies, powerful tho they are, will sterilize dentin and cementum in the same manner this combination will destroy bone cancellations, as shown by Callahan's slides in which sodium and potassium are shown to penetrate bone exclusively and deeply, and sulphuric acid is self-limiting. Will these reach, thru the canal, the utmost circumference of the cementum via the tubuli and granular layer of Tomes? I confess I do not know what will, for as many cultures of apices have been positive as negative, after using these remedies. Following the experiments of Zentler, in testing out ionization.

Is the final cut apical section of dentin and cementum sterile? That is the answer to the question, as to the final success of this operation. Have we left one septic segment in the cycle of an otherwise aseptically and technically correct surgical operation?

Possibly the silver reduction method of Howe or Rickert, as applied by Dr. Lyons, may be the answer and may prevent many apicoectomies by sealing these tubuli. Dr. Hartzell makes no effort to close them, depending upon sterility obtained by his method in the dentin; he operates immediately after filling the canal by Callahan's method; in every instance, where I have seen that done, no matter what the pressure in the filling of the canal, the cut section of gutta-percha was so soft, it often pulled out of the root-canal.

Dr. Lyons said "that an isotonic anesthetic solution, if properly used, does not interfere with the process of repair." I am glad to hear that, for I have seen in practice and in "clinical movies," dentin, cementum and bone made so dry that in using a bur, we had "a sawmill scene;" possibly from too high percentage of suprarenin, limiting hemorrhage, which, in these cases, could not be induced normally, before closing the wound. This is also true of extracting and curettement, normal hemorrhage, regardless of technic, asepsis and germicides, is nature's best wound dressing. We must not lose sight of this fact to obtain a dry operative field.

Neither essayist specifies what types

of teeth are suitable for operation and the occlusal force is not considered; possibly it was understood that apicoectomy only succeeds on single root of teeth. Roots, as well as cusps, are built to meet stress and are definitely related; apicoectomy in molar teeth is poor mechanics, unless the middle and gingival third peridontal fibres have compensated, as many of these cases, with floating apices in granulations for years, do; the radiographs showing a condensing osteitis, which fuses definitely into the lamina-dura in the periapical region.

Dr. Hartzell's "Indications and Contraindications" are of the utmost importance. Permit me to quote him. He says, speaking of the patient's general health, "First of all he should present absolute normality physically in every respect. His blood stream should run a normal number of erythrocytes and leucocytes, and he should possess a normal haemoglobin. His energy should be plus and his heart sound, as well as his kidney, with no sugar, casts or albumen existing in his urine. No type of infection should be present in his body." In my experience this glowing state of health, Dr. Hartzell describes, is very rare indeed, and only a skilled internist, with a group of associated specialists, can determine it. This obviously greatly limits the field for apicoectomy, and correctly so I believe, for as a means of absolutely blotting out a possible focal area, this operation is still decidedly experimental.

But it is even more interesting to quote further, where he says: "For instance, a person who is suffering coincidentally from tuberculosis, should never be permitted to undergo apicoectomy. This same rule applies to one who is suffering from a rheumatic condition or gastro-intestinal infection." In other words, Dr. Hartzell makes it quite plain that the patient must not be suffering from any phase of toxemia or focal infection.

When we apply this rule to the diseases, said to arise from focal infection, rheumatic conditions for instance, or disturbance of the blood cells in anemia, all of which Dr. Hartzell has proven in the past are the result of periapical infection, we find the field for apicoectomy again still further limited, because then we cannot do this operation on a patient suffering from other apical areas in his month; or even on the apex about to be removed, for it might also be the disturbing systemic factor, and who can say which is the primary portal, except by operative elimination.

So according to Dr. Hartzell's paper, in patients who are suffering from focal infection, oral or otherwise, we should not perform apicoectomy, but should extract and curette. As many cases have been reported in the past where this operation entirely relieved these systemic conditions, I am glad to have so eminent an authority come out frankly against experimenting with these states and I heartily agree with him.

How do we know the canal side of the apical cementum, contained foramina, and dentin are always infected, when there is periapical disease? We do not. I am convinced that many periapical lesions are produced by pulp putrefaction and infection passing thru the foramina, producing proliferating periodontists and granulomata with denudation and infection of the superficial apical cemental lamina, before the whole apex and all accessory foramina are deeply infected.

Later, we know, from the German pathologists and our own experience, many granulomata and cysts become centrally sterile, tho the fibrous walls and bone involved surrounding them, are usually infected. But just how to determine such a condition is a question.

I want to congratulate the essayists and this society on the high tone and conservative ideas expressed in the papers of Dr. Hartzell and Dr. Lyons; they are much needed at this time. I

have enjoyed greatly reading them and appreciate the honor of being allowed to discuss them.

H. A. Maves, Minneapolis, Minn.
Discussion on Drs. Hartzell's and Lyons' Papers.

It is indeed a privilege and an honor to be invited to discuss such timely and interesting expositions on apicoectomy as have just been given by Drs. Hartzell and Lyons, and wish to take this opportunity of expressing to them my sincere appreciation of their seriousness and conscientiousness in attempting to solve a successful technic in the face of so many difficulties, and wish to congratulate them upon their success.

The period in which we are living, I believe, is one of change, and we come face to face with our limitations almost daily.

The answer to Herbert Spencer's question: "What knowledge seems of most worth?" is surely that which conserves the health, and the teeth under discussion, certainly play an important part in this conservation. Therefore, we want to be certain that the so-called cures are not only temporary cessations of inflammatory processes. Drs. Hartzell and Lyons admit that if the operation is not successful, planting of secondary infection in the blood-stream is sure to follow.

Dr. Lyons spoke of the manner in which he sealed the apical foramen and dentinol tubuli with silver nitrate, which appeals to me, and am of the opinion this would be ideal; also the use of a finishing bur in place of stones to smooth the rough margins of the bony cavity to prevent the danger of particles from the stone working into the bone, has a great deal of merit. Nevertheless, in the face of this well systematized and standardized technic, knowing the important role that such foci of infection play in general systemic diseases, are we justified in advocating this operation when it is admitted that the tissues around the apex of devitalized teeth, have not the high resistance of normal tissue, where the circulation of blood has not been damaged, and exceptionally few are free from Gingivitis or Pyorrhea, and the possibilitity of rendering root-canals sterile—still a question?

Graham says: "A chronically infected area cannot by any method, be incised or curetted without leaving a goodly number of bacteria within its walls, causing secondary infection to follow in many cases.

The discussion of any surgical procedure entails a consideration of the embryology and histology of the part involved, the attendant pathologic processes and the nature of the repair which we will briefly consider.

EMBRYOLOGY.

Keibel and Mall.

The bones of the face and skull are intra membranous in origin, i. e., developed directly from membranous tissue, whereas, the long compact bones of the extremities, occur from centers of ossification within performed cartilage. Formation of the alveolar process begins in the fourth foetal month and is completed in the twentieth year.

HISTOLOGY.

Stohr Lewis-Piersol.

Thruout the period of its development, the Alveolar process is occupied with the continual modification, due to the growth and development of the teeth. This results in a rather typical non-medullated, cancellous bony framework of a *marked vascularity.*

PHYSIOLOGY.

Talbot (Develop Mental Pathology.)

The alveolar process is a relatively specialized type of bone which is in a stage of transition. This is illustrated in various ways, e. g., the so-called "Theory of recapitulation" (Angell) says that the life of the individual parallels the life of the race. In the span of a man's life the alveolar process reaches its highest development early

and then tends to atrophy. This also has been the history of the maxillary development of the race.

It is a biologic axiom that the higher the specialization of a cell, the less marked are its powers of proliferation and resistance. This has been noted and applied to bone by Albee (Bone Surgery). McErven (Growth of Bone), says: "Cancellous tissue heals well but *sparingly.* Regeneration of osseous tissue of the flat bones of the skull is *less vigorous* than in compact bone."

PATHOLOGY.

Henrici, Haasler, Etc.

An apical granuloma is nature's attempt to wall off an infected focus. Sections show encapsulated apical areas consisting of young connective tissue cells and surrounded by a more or less dense wall of bone.

SURGERY.

All surgery within the mouth is more or less septic—nevertheless, healing takes place by first intention.

DeGauljec and Nathan (Bull De Cherergue de Paris 1918) in a study of pathologic bone substance state that a hematoma or blood clot is an obstacle to bone regeneration. This undoubtedly applies to large bone involvements.

F. Sargeant (Report of Royal Army Med. Corps, London, 1919) says that efforts to close bone cavities with blood clots decalcified bone chips, wax plugs, etc., are failures.

A review of modern surgical texts, gives the same opinion. Beck and others, have used muscle and skin flaps to cover the denuded and curetted bone surface successfully. This is obviously impossible in the mouth.

With normal dental and peridental tissue we are sufficiently familiar, and while the minute organization of bone is still a matter of dispute, the *outstanding character* of the alveolar process *is* its cancellous structure and absences of true medulla.

Briefly then, any lesson involving the teeth and alveolar process is that of a rather high specialized tissue whose properties of regeneration and repair are deficient.

Root amputation is presumably performed upon those teeth which have incurred apical infections.

From the experimental work which has been done and from clinical observations we have no positive evidence as to what percentage of infected teeth are rendered so by septic technic, and what percentage become so as the result of establishing a locus minoris resistentae thru the trauma incidental to root canal treatment.

Whichever may be the case, the reaction of the tissue is the same, i. e., an attempt is made to isolate the affected area.

Usually the invading organism is of a low order of virulence and, as a result, there is an infiltration of lymphocytes and a proliferation of the fixed tissue cells. This results in the formation of a mass of epithelioid cells. The surrounding bone, readily susceptible to injury, fails to regenerate but forms a dense encapsulating wall of sclerotic tissue.

The foregoing is nature's remedy in its most favorable ending. If the organism is virulent, more bone is destroyed and drainage is established or encapsulation may occur at a later stage, larger and more imperfect.

In some cases Rosenow of the Mayo Clinic has demonstrated the organisms thruout the whole capsular mass. Finally let us consider Surgical treatment in relation to this Embryology and Pathology.

Root amputation aims to remove the affected tissue in whatever state of repair it may be and to restore it to its original condition. Granting this possibility, the best that could be hoped for is a return to the condition preceeding the infection. This is necessarily so, because the tooth or foreign body still remains in situ together with the super added scar tissue. Now, the higher the

order of connective tissue, the more adequate must be the blood supply. Hence, with scar tissue necessarily involving the highly complex dental and peridental tissue, the impossibility of a restoration of normal condition is obvious and the locus minoris resistential persists in aggravated form.

Notwithstanding the futility of surgical treatment as a resorative measure, the technical difficulties are almost insuperable. Therefore, at the outset, root amputation is bound to be questionable surgery. The best result to be obtained is but a poor imitation of what nature has attempted. The original condition of health and normality can never be restored either anatomically nor physiologically. In the first place, there is the handicap of working upon a structure which reacts poorly to treatment, a transitory tissue of poor regenerative power.

X-rays are deceiving; they show a dense area about a root which is often nothing but a capsule of scar bone. Am of the opinion, when all is done, the same predisposition to further infection persists. Therefore, with so many difficulties to overcome—I sincerely hope that the profession will benefit by the valuable suggestions of Drs. Hartzell and Lyons in exercising great care and precaution in the selection of cases for successful apicoectomies—in order that the patients receiving such service will be greatly benefited.

Arthur D. Black, Chicago.

Discussion Hartzell's and Lyons' Papers.

We have all been impressed with the question of doubt presented by both essayists in these very valuable papers. The question of doubt is the immediate area about the resected root-end. There is ample evidence in the papers that the postoperative condition of the tissues about the end of a resected root are not known. It has been suggested that we are only justified in doing this operation for an individual who is in perfect health. The question may then be raised as to our duty to the individual in perfect health; if such an abscess is the only pathologic finding, should we not extract his tooth and be sure to keep him in perfect health? (Applause).

The more I have studied my cases, the less root resection I have performed each year. I have followed my cases carefully with subsequent radiographs, and the great percentage look very well in radiographs taken some months after operation; that is, they show that the cavity in the bone has been partly or almost entirely filled in. We must remember that the physiologic tendency of bone in this region, when a root is amputated or when a tooth is extracted, is to fill in the area, therefore, if by operation the irritation to that region is removed, we would expect the bone to fill in close down to the end of that amputated root. That does not prove that the case has healed. It is necessary to follow these cases year after year and with radiograph after radiograph before we shall be able to state what percentage does well. I want to confess to you that, in my own experience, a very good percentage of these have shown well in radiographs within six months or a year or even longer after operation, but as I have followed them along five, six, or sometimes ten years after, in cases in which the teeth have remained that long, I have not been encouraged by the radiographic findings. We too often find that the bone, which was built in after the root resection, has been later destroyed.

M. L. Rhein, New York City.

Discussion Hartzell's and Lyons' Papers.

It is very difficult to say anything in a word or two on the excellent presentation that we have had of this subject. The question of root amputation is not new to me. I read a paper before this society in 1887, describing the procedure which I used at that time. I continued the active use of this operation for about ten years. About 1895 in my use of electrolytic medication I obtained such bene-

ficial results. I began to abandon the operation more and more, so that at the present time the operation is one that I have recurrence to in only the type of cases as presented by Dr. Hartzell.

Now there is one aspect of this subject that has not been brought out, that is the histo-pathology of it. We avoid the danger of infection of the stump of the amputated tooth, but nothing has been said in regard to the change of the osteoblast into osteoclast. That is a change that is very common, that is, the appearance of the osteoclasts immediately after operation reacting in continuous resorption of the amputated root. It is for this purpose, I suppose, that Dr. Lyons has made use of the reduction of silver nitrate to silver. We also know that silver itself, as he has said, has absolutely no germicidal qualities. It is, therefore, of no benefit as a germicide. My own method is to cover the stump of the amputated root with a coat of gutta-percha. That I know to be absolutely sterile. At times I have used amalgam for this purpose. This capping of end of the root must be done in the open wound immediately after the amputation.

T. B. Hartzell (Closing): It seems to be the consensus of opinion of the men who have discussed these papers, if you followed the diverse or peculiar impressions that have been brought out, that we are not all agreed on apicoectomy. I would like to tell you a short story that will put my story straight with you for it is the opinion of the author that apicoectomy is too often resorted to.

You know the young American is often an irreverent fellow. There was an Irishman who asked a young friend to go with him to Mass. He had never before seen Mass celebrated, and when he saw the censor bearers swinging the incense and saw the people kneel and rise, he turned to his friend and said, "It beats the devil." To which the Irishman replied, "That's the intintion sor."

It does not do to run to extremes. Every man should form his own judgment. It is the duty of every man who comes to this society to try to present a subject as he sees it and it is the duty of each man who comes to this society to form his own judgment, so I hope you will form judgment in regard to this work which you can use in your future practice.

I would advise that you do not go to extremes but that you use this evidence and use it wisely, regarding every new case as a separate entity and be guided in your treatment by the diagnostic evidence you gather.

Chalmers J. Lyons (Closing): In answer to Dr. Hinman, regarding the incision, I am not particular whether you make a curved or a straight incision. This is not a factor in the success or failure of the operation.

The question was brought up by Dr. Grieves that the isotonic solution interferes with the process of repair. I said in my paper that clinical experience has proven that isotonic solution will not interfere with the process of repair. That clinical experience is backed up by laboratory experiments, that it does not cause any change in the tissue cells. We have not found a single case in which the use of the isotonic solution interfered with the process of repair.

Another point that Dr. Grieves made was that he did not see how I filled these canals. I refer you to the paper by Dr. Rickert, published in the October number of The Journal of the National Dental Association, in which this matter is covered very thoroly. Dr. Rickert has cooperated with me in reducing silver in the canals and tubuli and filling the canals with gutta-percha just previous to our operation. Our work thus far has been very encouraging and we may have something to report later on, as to the final conclusions, relative to the practicability of root resection in dental practice.

PHYSIOLOGY AND PATHOLOGY OF INTEREST TO DENTISTS.

By Jules J. Sarrazin, D. D. S., New Orleans.

(Read before the National Dental Association at Its Twenty-third Annual Session, New Orleans, La., October 20-24, 1919.)

THE etiology of gum recession may be dystrophic, mechanical, or infective, or it may be a combination of those causes.

Dystrophic gum recession is the first objective symptom of Dental Periclasia, and it is a predisposing cause to Pyorrhea.

A disease, acute or chronic, is produced by a predisposing and a direct, or exciting cause, often with (1) contributory factors. The direct cause is usually infective. Pyorrhea follows the rule, of course.

Thus, lowered resistance consisting of reduced opsonism, or of less active or less numerous polymorphonuclear leucocytes, the ingestion of Bacteria Typhosus, with the contribution of favorable (2) culture media, due to character of food, or condition of digestive secretions, and typhoid fever develops.

Similarly, lowered resistance due to Dystrophia of alveolar tissues, staphylostreptococcic invasion, helped by the retention of infectious plaques between teeth and by faulty dentistry, or by the trauma of faulty occlusion, and Pyorrhea results.

The start was Dental Perioclasia, and it will be the end.

Occasionally, in general Pathology, either the direct or contributory factor of disease may have (3) been nervous disturbance leading to Neurasthenia, causing faulty Metabolism, with the resulting indican poisoning of tissue cells; and when such conditions are coupled with Pyorrhea, they must be corrected before capillaries can actively (4) throw out loops to regenerate tissues by building new cells where infection has required extensive curetting. Indeed, systemic conditions can never be dissociated from the treatment of a disease, the eradication of which depends, after the removal of infection, upon favorable physiological conditions for the repair of injured tissues, which can granulate only from one side of the wound, while the cemental surface offers favorable opportunity for re-infection. Far more "Vis Medicatrix Naturae" is needed than in the wound where capillaries can throw out loops from opposite (5) directions.

Five hundred thousand years ago, the ape-man of Java stopped active exercise in the open air only to lie down for rest at frequent intervals, like do wild animals; but unknowingly, by natural instinct, to facilitate the heart feeding arterial blood to bodily tissues above it. He knew raw foods only, the pabulum from which is freely soluble in oral fluids, as compared with the creamy substance lodging in inspissated mucus from cooked material. Germs were left no favorable plaques to grow in, either to infect gums, or to carry disease to contiguous tissues, or by moisture globules, or by the ingesta. His food was hard, coarse, fibrous; joining cleansing to eating; requiring active exercise of mandible, and strong maxillary impact. No

demand was made on the brain for more arterial supply, no draft on Neurons, for the feeding of which the plan of physical evolution has provided the circle of Willis, to serve spiritual involution, that thought may be fully served while all physical functions are regulated by the central station of the nervous system; but the moment physiological natural laws are at all broken, thought and central cerebral control are carried on at the expense of tissues intervening between heart and brain. The former pumps columns of blood against gravity to the latter. (6) The internal carotids are free channels, the circle of Willis is an open distributor, and peripheral and capillary resistance (7) are less in cerebral cells than in the muscles and mucosa which the external carotids supply. The most important (8) demand is met, and intervening tissues, jaws included, suffer from dystrophia, because the balance between the mental and the physical has been broken; not that we should revert to primordial life, but that we should apply the adequate correction which preponderant mentality teaches, as soon as, or even before the first symptom of Dystrophia, gum recession, shows.

The Heidelberg man, two hundred thousand years ago, (9) looked slightly less brutish-animal-like. He had fourth molars and long mandibles; the brain was small and only objectively active, making no demand for arterial blood at the expense of intervening tissues. Of course, he slept nights as much as carnivora allowed, and followed nature's plan of equilibrating circulation by frequent day naps in the horizontal position, followed by repeated active exercise to stimulate proper pumping by the heart.

One hundred thousand years ago, the Piltdown man, Sussex, England, and the Neanderthal man, France, fifty thousand (10) years later, show the first signs of cerebral activity by the sharpening of stones for missiles and for spears. Cerebral demand was growing, but was amply supplied, nature's plan having full sway.

The first departure from nature's law on activity and horizontal rest must have dated back to the Cro-Magnon man, who inhabitated western Europe twenty-five thousand years ago. He (11) belonged to the same species that we do: "Homo Sapiens." He was an artist by inclination and a hunter by necessity. Drawing outlines of bisons he killed for food, on the walls of caves he inhabited, would keep him mentally interested, often in positions unfavorable to free circulation, at times when horizontal rest would have been indulged in by his predecessors. The brain instrument (12) of soul was growing. Fourth molars had gone. The seed was sown for the tendency of tissues intervening between heart and brain being robbed of their full share of arterial blood, as brain demands increased, and measures for supply lessened. Besides, the Cro-Magnon man lighted his cavern homes with animal oils and fats. He cooked his bison and other foods, starting the formation of pabula in inspissated mucus films, on teeth necks, which were no longer as soluble to oral fluids as those formerly resulting from raw foods. Thence on, crania show little occasional caries, and sometimes, but seldom, small areas of Dental Periclasia about roots. Circulation was still far too active for much damage to be done; resistance too great; opsonins strong, bacteriolysins powerful, agglutinins efficient, with numerous phagocytes carried by an active blood stream; and vigorous mastication of food still coarse, coupled with active normal secretions, supplied local Prophylaxis. The seed was sown for future Dental Periclasia; that is all.

Even now, do we see the farmer, who works his muscles more than his brain, and sleeps after his noon hour meal, and the laborer, whose foreman does the thinking, and who stretches on the

ground after emptying his dinner pail, with alveolar tissues sometimes remarkably resistant to an intensity of infection which would long since have caused Pyorrhea and Dental Periclasia in the individual with more sedentary habits, whose active brain demands are supplied at the sacrifice of other tissues above a heart, which is not helped, in its efforts to feed all upper tissues, by arteries being dilated by means of horizontal (13) rest about the middle of waking hours.

This habitual comparative scarcity of arterial blood to the upper tissues, while those below the heart suffer no dystrophia, is well shown by the fact that wear is expressed by wrinkles (14) in direct ratio to cerebral strain, work and worry, while excess of blood in splanchnic regions causes too active cell formation, (15) enlarging the abdomen. Bystrophic tissues shrink and plethoric ones expand.

The warmer the climate, the laxer the tissues; the greater the tendency for columns of blood to gravitate downward, and the difficulty for the heart to pump them up, because they are less (16) supported. People living in equatorial countries, have, without knowing the physiologic reasons therefore, made the noonday siesta (17) a habit, because without it they feel exhaustion later; this because adequate arterial supply to brain can no longer be maintained.

The instinct of nature prompts the tired man to prop his legs, where columns of blood have been dropping, (18) much higher than good form allows. He doesn't know why, but it feels good. The brain needs the surplus blood from below.

Eliminating the pathology where nervous disturbance is a direct etiologic factor, and Pyorrhea is therefore under consideration, we may say that the susceptibility to infection depends on the lack of resistance of tissues, resistance being made up of the proportion of active phagocytic leucocytes, aided by opsonins, agglutinins and (19) bacteriolysins, which reach tissues, and of erythrocytes and lymph to build cells. It is, after all, a question of arterial blood cells coming to tissue in sufficient quantity and rapidity to destroy penetrating infective germs, before they may create a lesion, and before leucocytes lost activity in venous (20) blood which is not driven away fast enough. Whether the lack of proctection to tissue is due to *General* or *Local* anemia matters not, the result will be the same, that is, rapid infection and destruction of cells. Oral clinical observation leads to the following:

Mild Infection+High Resistance= Immunity;

Intense Infection+High Resistance= Slow Pathology;

Mild Infection+Low Resistance= More active pathology;

Intense Infection+Low Resistance= Rapid Suppurative Dental Periclasia.

While the above applies especially to Pyorrhea, it follows Pathologic law as well in all organs or tissues, thus: gastritis, septic gastritis, gastric erosions and ulcers; — Nephritis, Interstitial Nephritis, Suppurative Nephritis; — Anemia, Septic Anemia, Septicemia, Coma, Death. The rapidity of pathology is in direct ratio to the intensity of infection and lack of resistance to it.

We may never lose sight of the fact, when dealing with Suppurative Periodontoclasia, that infected blood cells are destroyed (21) by the spleen, that anemia results if cells cannot be replaced as rapidly as destroyed, and that following curetting of roots and sockets, tissues at all anemic, whether from *Local* or *General* vice, are unable to build resistant repair cells to protect against contiguous mild infection. If the anemia be *Local*, the manner in which blood comes from the lobe of the ear shows it, altho hemoglobin may be normal. The remedy is to improve and properly equalize circulation, so that upper bod-

ily tissues receive the amount of arterial supply due them. If the anemia be *General,* measures to assure assimilation and metabolism must be combined with a *Reconstructive* tonic. If the anemia be both *Local* and *General,* both the quality and the circulation of blood must be improved.

In curetted Dental Periclasia pockets, it is a question of tissues being capable of rapid repair in unfavorable wounds, by granulating against cementum, instead of the usual knitting of flap to flap. Only such curetted pockets are capable of healing whose arterial capillaries carry a sufficiency of actively circulating blood of perfect quality to throw out resistant loops, which become cells. Any lessened proportion of erythrocytes, however little, counts as anemia under such circumstances. Nothing less than the full normal can be considered sufficient, since new cells must be produced rapidly under unfavorable conditions, where the disadvantage of infection carried from near-by pockets, not yet curetted, is at least as great as the help of inherent vascularity.

Systemic diseases leading to the destruction of tissue cells, are the greatest foes of maxillary and mandibular root sockets. This is easily understood since the expression of dystrophia will be greatest where lessened arterial blood supply is more marked. Fundamentally, however, what counts is the pathological destruction of blood cells vitiated either by a chemical or bacteriological poison, thus leading to anemia; and the relative position of anemia in the march of the stages of diabetis, nephritis and syphilis is the true key note; they being the three diseases, with the exception of anemia itself, which are justly recognized as the systemic conditions which most hinder the recovery of alveolar tissues.

In the march of clinical symptoms characteristic of *diabetes,* anemia is third, as follows:

1st—Excessive urine.
2nd—Voracious appetite.
3rd—Anemia.
4th—Loss of strength.
5th—Emaciation, or Fatty Degeneration.
6th—Hepatic Sclerosis.
7th—Pancreatic Sclerosis.
8th—Arterio Sclerosis.

In chronic *nephritis,* anemia comes fourth:

1st—Edema of eyelids.
2nd—Headache.
3rd—Dyspepsia.
4th—Anemia.
5th—Progressive loss of strength.
6th—Diarrhea.
7th—Excessive urine.
8th—Albumin and casts.

While in *syphilis,* which renders periodontic treatment less refractory than *nephritis,* and very much less than *diabetes* (which latter makes it hopeless in advanced conditions) anemia develops as the fifth clinical symptom, as follows:

1st—Chancre.
2nd—Lymphatics, Mucosa.
3rd—Periosteum and Bone.
4th—Synovial Membrane.
5th—Anemia.
6th—Congestive Wasting.
7th—Spinal cord.
8th—Internal Viscera.

Of course, the above clinical marches of pathologic progress vary slightly in different cases, but they nevertheless explain why diabetic cases are so refractory to periodontic treatment, while, instead, and in spite of much that has been written on the subject, the experience of observant periodontists is that leutic cases readily respond to treatment, provided that the Anemic stage has not been reached; and as patients who have become invalids seldom present for treatment, we may say that results in syphilitic cases, backed by proper systemic and local treatment, are practically as secure as in normal ones, prior to

general anemia; this in spite of periosteum and bone having been affected, provided, again, that adequate systemic treatment was applied at an earlier time. It does look strange that alveolar walls can even repair, without of course reproducing anywhere nearly to original lines, following systemic disease involving periosteum and bone, but the phenomenon is explained by the vascularity of periodontal tissues, being given a full arterial blood supply of good hemoglobin quality, actively circulating, in spite of the reduced luetic taint it may still carry. Nature and its processes are wonderful guardians. Who knows but what phagocytic power may not be increased against other microorganisms also, by constant exercise against a special one? provided, always, that no anemia be present, either *local* or *general.*

General anemia is not a syndrome of tuberculosis, except in more advanced stages, and that accounts for observing little Dental Periclasia in such patients, because they are made to frequently lie down, and thus antagonize local anemia of upper bodily tissues.

Ultimately, we must always revert to the preponderance of resistance or infection; and acute ulcerative gingivitis, which has of late been called trench sore mouth, and which leads to Dental Periclasia, offers an excellent example of infection so intense that only the very highest type of resistance could prevent rapid ravages, and none arrest slow pathology. Under its old name, periodontists of experience are well acquainted with the war disease. Its main difference with acute ulcerative gingivitis are more intense filthy infection, resistance lowered by hardships, if not also by a shade of anemia, and a trench near-by for nomenclature.

Another condition to lower resistance of tissues is the neurotic effect on metabolism by which the (22) indigo-indoxyl-indican conversion occurs, which leaves the latter as a poison to cells. This, of course, is independent of anemia, but indeed very apt to be coupled with it in a mild form at least, since some blood cells become poisoned, and will be destroyed by the spleen. The same holds true either in constipation or fermentative diarrhea, (23) where putrefaction and germ life are increased, and the toxins resulting therefrom find their way to portal circulation (24) thru the villi of the small intestines.

Auto-intoxication leads to Anemia, by rendering some blood cells unfit for circulation; intoxication aggravated from raw surfaces in Pyorrheal pockets, from intense filmy and calculary infection in the mouth, from pus cells which reach the intestinal villi, or are absorbed even before they do, from faulty metabolism, from diarrhea, from constipation. Thus do we see that those conditions which lead to Auto-intoxication, bacteriologic or chemical, lead to anemia, and are to be considered as etiologic factors, converging with faulty hygiene, neurasthenia, diabetis, nephritis, syphilis, to produce the same ultimate anemic result, either singly or in combination; and let us not lose sight of the fact that when bacteriologic invasion of blood cells becomes intense, and resistance lowered, septic (or pernicious) Anemia precedes death.

Dr. B. Moore, London Lancet, Sept. 13, 1919, believes that in neurotic or surgical shock, conditions ascribed to "acidosis" are really due to "alkalosis" instead, but in considering the chronic conditions which interest us, the writer thinks that the accepted views taken by Hawk, Halliburton and Pierce & McCleod on the subject, are safer guides, furnishing sounder pathology.

Acidosis is seldom recognized prior to emaciation and debility leading to invalidism. The moment that blood serum loses (25) alkalinity, endosmosis and exosmosis are hindered, and cell development and growth inhibited. It may be neurotic, bacteriologic or organo-chemi-

cal in origin. The organic acidity is generated in tissue cells, as (26) a result of faulty metabolism and the breaking down of fatty tissues, taken up by venous blood, and when it becomes too great for complete elimination by excretory organs, it affects (27) the arterial blood stream. The blood stream does not become acid, in spite of the name; death would precede. It merely loses alkalinity. Of course, even a mild degree of acidosis leads to Anemia, since cell development is hindered, and the bone marrow (28) supply to blood is thereby reduced. Acidosis is usually diagnosed too late to save health. The oral barometer, however, furnishes timely indications. Salivary glands may only secrete from blood, and therefore only what is in blood, and habitual salivary acidity indicates incipient acidosis. Erosions which cut grooves deep into labial and buccal surfaces of teeth, (seldom lingually,) smooth and polished, with no story of cross brushing, are indicative of strong organic acidity, the activity of which is beyond that of the organic acids known to be present. Exceptionally, without mechanical abrasion being a factor, the gold of a shell crown is dissolved thru, and the erosion continues into the tooth substance, or the erosion attacks a gold filling and the tooth evenly. We know of no oral organic acids being capable of doing the damage, but we see it clinically.

What nitric and hydrochloric acids cannot do in sequence, they do in combination. Such acidity, however, is an unfailing indication that it exists in the blood proportionately, since the salivary glands (29) have there taken it, and there should the remedy be applied. In addition, acid mouth conditions favor bacterial development, and increase danger and intensity of infection. Acidity of urine will also be noted in cases of erosions like the above, for the same reason that glands secrete it. Fundamentally, therefore, it is the neurotic, metabolic, bacteriologic, or organo-chemical causes which affect blood that we need to reach.

While recession, with the exception of congestive cases of it due to infection, is the first indication of a predisposition to Dental Periclasia, it is also usually present in cases of erosions of the type above described, loss of alkalinity in the blood stream hindering the formation of new cells.

The condition of blood, and the absence of slight anemia especially, are dependent upon assimilation and metabolism, and both the latter on the absence of neurotic influences which also affect ductless glands and their internal secretions which are thrown in the blood stream. Primarily, therefore, measures to equilibrate nervous function and blood circulation are called for, learned from nature's plan for primodial man, adapted by developed mind to the needs of the modern user of brain cells. Oxydize blood by morning breathing exercises; activate the heart and circulation by morning muscular and articular exercises, (30) evenly thruout the body; correct the plethora of columns of blood below the heart by afternoon rest (sleep best) in a horizontal position, (31) to dilate upper blood vessels and feed brain and jaws. If general anemia is at all marked, a reconstructive tonic is indicated, one which will furnish material for blood to build from, without misleading stimulation; but assimilation must first be helped, if need be. In addition, different systemic disturbances will call for different special medication to regain normal equilibrium on which vigor and cell growth depend.

Locally, gum massage, equilibrating muscular function and vigorous chewing are helpful.

Gum massage must be done in the direction in which venous blood is returned to the heart, so that the arterial supply which comes from beneath may freely bring resistant and rebuilding

properties to diseased tissue. Capillaries throw out loops, starting repair, because (32) the pressure of arterial circulation is behind them. If there be any anemia, locally, those loops succumb to the slightest trace of infection which they could otherwise overcome after thoro curetting. If the anemia is general, a trace of infection overpowers the capillary loops thrown out, because they contain blood in which the activity (33) of the phagocyting cells is reduced by environment.

Muscles closing the mandible are habitually contracted, and those opening it habitually relaxed. Blood flow is activated by the alternate contraction and relaxation of muscular fibres. Constant contraction hinders the passage of blood still more than relaxation. Have the patient introduce the width of his three first fingers, in apposition, between upper and lower incisal edges, four or five times in succession, repeating this exercise four or five times a day. Incidentally, operating will be greatly facilitated in a very few days by a larger opening, and less or no muscular cramping. Mucous tissue nutrition is dependent upon surrounding muscular circulation, also therefore alveolar supply, while impact of teeth further stimulates it. Unfortunately, however, traumatism must be considered, and vigorous mastication of hard coarse food is not permissible until loose roots are restored to health, and firmness increased.

Mouth infection is a habitual cause of tonsilitis. Infection is brought to the tonsils by contiguity and by moisture globules. Unless there be advanced follicular or suppurative tonsilitis, proper germicidal mouth treatment, tongue dorsal cleansing and gargling, backed by suitable medication, will habitually allow tonsillar recovery. The tonsils are very permeable to infection, but they are also very vascular, and therefore recuperative when infective etiology is controlled, and active circulation established. Tonsils should not be recklessly removed. They are one of nature's screen protections to the Larynx against infectious dust particles, and are constructed so as to withstand that invasion unless weakened by blood conditions or by mouth infection. All tonsils should be saved that can be, by improving the former and controlling the latter.

Enough has been said on the necessity of improving conditions, if at all below normal, but the heart's action must usually be helped for blood to be pumped vigorously enough to properly feed all bodily tissues, those above the heart especially, and this includes gums, which interest us especially, and brain which controls all bodily functions. Morning exercises and afternoon horizontal (34) rest are the desiderata.

Kidneys excrete, like salivary glands secrete, only what they may draw from blood, except that kidneys throw out in the urine the result of congestion, inflammation and suppuration of their own tissue, shown by granular casts and albumin, brought about by streptococcic invasion; while blood conditions which prevent healthy cell growth are shown by sugar, bile and Indican; and acetone and diacetic acid warn impending danger from the stoppage of endosmosis and exosmosis. Again, interstitial nephritis, induced by streptococci, impairs kidney mamelons until their function of excreting tissue poisons from the blood is at first partially lost, this preventing cellular growth, and in time leaving Urea in the blood to an extent sufficient for Uremia to cause death.

Morbid conditions which affect blood affect all bodily tissues and their ability to replace cells exhausted, worn out, or poisoned; alveoli included, of course. Blood containing toxic elements cannot develop healthy cells, whether the blood vice is caused by its inability to destroy infection reaching it, or by intoxication from any of the causes mentioned.

Even if the blood condition is perfect, but its supply is scant to any part of the body, the replacement of exhausted cells, or their re-vivifying in that part, is impaired. Internal secretions reach the blood to play their part in the (35) upbuilding process, but local anemia means dystrophia, and continued dystrophia results in atrophy. Moreover, subnormal hemoglobin is frequently found in youth, in females especially. Clinical observers frequently see the first indication of local dystrophia manifested as gum recession, at the age of fourteen, more marked with girls. This type of recession is more prevalent at incisors, canines and bicuspids than at molars, and above than below; no doubt because extremity tissues suffer still more than rear ones, and because the mandible moves. The young patient may be one whose personal home care is well nigh perfect. The trouble has not started from an infective process at gingival lines, but, of course, bacteria will lodge on cemental surfaces, once exposed, and increase the process, unless kept off by both the patient and the operator.

Dystrophic gum recession is that caused by insufficient arterial blood supply. It means lowered resistance of the tissues involved to extraneous infection. If started in youth, and with local infective causes not checked, it will in time develop Pyorrhea. It is a form of Dental Periclasia. Fundamentally, morning breathing and articular exercise, afternoon horizontal nap, bowels kept active. Locally, oral prophylaxis, home and office, gum massage, such as will repel venous blood to the heart, and exercising surrounding muscles by the three fingers' exercise already described. Individually, according to indications; blood test, stethoscope, urinalysis.

These "fundamentals" and "locals" apply to all cases of Dental Periclasia, incipient or advanced; and, of course, "individual" therapy varies according to conditions and to the internist.

Mechanical gum recession results from actual wear of mucous tissue cells at gingival margins. Cross brushing is its usual cause. It is more marked on exposed surfaces, lingually less than labially and bucally, wherever the wearing friction has been applied most, and very little approximally; slight recession there being due to the fact that septa contain less capillaries than broader alveolar walls, and that septa suffer from dystrophia as the latter are impaired by mechanical recession; their lines, however, shrinking slightly, even if there is no infective etiology in combination. The same "fundamentals" and "locals" apply as in dystrophic recession; the patient, of course, being trained in the technic of brushing recommended by the American Academy of Periodontology.

Infective gum recession is that in which tissue cells are destroyed by the time honored gradual processes of congestion, inflammation and suppuration, caused by bacterial plaques or concretions at gum lines. Of course, it is not limited to exposed surfaces, since infection is usually more intense approximately than elsewhere. Resulting inflammation may seem superficial only, and tumefaction may be misleading, but eventual recession must follow, as the lesion becomes both interstitial and parenchymatous; altho no suppuration may show at first other than pus cells under the microscope. This form of recession is the predecessor of chronic Suppurative Periodontoclasia. Bone cells follow mucous tissue development or destruction. The cause is the penetration of toxins from germs at first, and afterwards of the germs themselves; mainly, the streptococci followed (36) by the staphylococci. The remedy is repeated office prophylactic treatment, giving special attention to approximal surfaces, not with pick axes and wood points which cannot reach, but with delicate curettes and a smooth grit polishing paste

carried on a waxed silk tape, which do; finishing with Dr. Eugene S. Talbot's germicidal, toneing, penetrating, iodo glycerole, which stains bacterial films which may have escaped, and demand further attention. At home, repeated personal care of the kind mentioned, backed approximally by waxed silk tape in which polishing powder had been incorporated by the manufacturer, and the same "fundamentals" and "locals" apply.

"Individual" therapeutic measures are called for if there be indication of lowered resistance which must be increased, of the slightest organic lesion, if symptoms point to infection having entered the blood current, or having affected the nervous system.

Conclusions.

The dentist should ascertain the cause of gum recession, or of the slightest congestion at gingival margins. Remedial treatment, systemic and local, should be applied at that time to prevent development of the different forms of Dental Periclasia. Nowhere is the truth of "one stitch in time" greater.

In diseases which affect tissue cells, it is the promptness or tardiness of the anemic factor, which renders periodontic treatment hopeless or successful.

The slightest erosion, which is ascertained to be free of any mechanical factor, indicates systemic vice which must be corrected under penalty of loss of health, or of reducing resistance to infection until only a mild amount of it will produce suppurative disease.

The combination of systemic measures based on nature's plan, and of special ones where needed, coupled with *office* and *home* oral prophylaxis, would eliminate dental periclasia, either atrophic or suppurative, if started in time.

Locally, improve circulation by massage, by relaxing masseter, temporal and buccinator muscles, and by vigorous chewing.

More office and home oral prophylaxis would lessen tonsillectomy.

Bibliography.

(1) Adami & McCrae—Pathology, pages 55-56, (2nd edition).
(2) Osler—Principles and Practice of Medicine, page 4, (8th edition).
(3) Adami & McCrae—Pathology, page 107.
(4) Mallory—Pathologic Histology, pages 71-75.
(5) Ibid.
(6) Lerch—Rational Theraphy, page 73.
(7) Ibid.
(8) Ibid.
(9) Osborn—Men of the Old Stone Age, (2nd edition), page 23.
(10) Ibid.
(11) Ibid.
(12) Blavatsky—Secret Doctrine Vol. II, page 721.
(13) Lerch—Rational Therapy, page 75.
(14) Ibid, page 78.
(15) Ibid.
(16) Lerch—Rational Therapy, page 78.
(17) Ibid.
(18) Ibid, page 75.
(19) Halliburton—Human Physiology, page 474.
(20) Adami & McCrae—Pathology, pages 124-125.
(21) Halliburton—Human Physiology, page 334.
(22) Hawk—Practical Physiological Chemistry, pages 169-298.
(23) Osler—Principles and Practice of Medicine.
(24) Piersol—Human Anatomy, page 1635.
(25) Halliburton—Human Physiology, 325.
(26) Hawk—Physiological Chemistry, page 350.
(27) Ibid.
(28) Halliburton—Human Physiology, page 43.
(29) Pierce & McCleod—Human Physiology, page 52.
(30) Lerch—Rational Therapy, page 110.
(31) Ibid.
(32) Mallory—Pathologic Histology, pages 71-75.
(33) Ibid.
(34) Lerch—Rational Theraphy, pages 73-110.
(35) Schaeffer—"The Endocrine Gland."
(36) Hartzell.

NITROUS OXID-OXYGEN ANESTHESIA IN ORAL SURGERY AND DENTISTRY.

By J. A. Heidbrink, D. D. S., Minneapolis.

(Read before the National Dental Association at Its Twenty-third Annual Session, New Orleans, La., October 20-24, 1919.)

NITROUS Oxid-Oxygen Anesthesia is employed generally by Exodontists for the majority of extractions. It is doubtless the most satisfactory anesthesia for our work for the following reasons: It is quickly induced, a comfortable anesthesia resulting in approximately one minute and forty seconds in the normal case. The anesthetic is as quickly eliminated entirely thru the lungs without tax on these or any of the other eliminating organs; and because the anesthesia may be safely prolonged. (The longest I have been required to carry a patient in deep anesthesia for dentistry was an hour and thirty minutes).

Nitrous Oxid-Oxygen Anesthesia is accomplished with the minimum of after effects, usually none. However, in some cases, nausea or depression, or both, may follow the administration. Patients predisposed to nausea, especially if the stomach is full, are likely to be disturbed. In many instances where nausea and vomiting occur, investigation reveals that the food has remained undigested in the stomach for from four to five hours. It is not surprising that under such circumstances nausea follows the administration of an anesthetic.

Distinctive types of cases may come in bunches. We may have a run of nauseated cases and conclude that something is wrong with the gas or the method of administration. Nausea is quite likely to result from faulty administration; for example too slow or too rapid induction, over-anesthetization, or an uneven anesthesia.

However, undesirable after-effects are not sufficiently frequent, severe or prolonged to be of any considerable consequence. This is especially remarkable when we consider that the majority of dental patients come without any preparation, such as usually precedes the administration of other general anesthetics; and that many are in a highly nervous condition, having suffered pain and loss of sleep for several days.

The character of anesthesia obtained from Nitrous Oxid-Oxygen depends much upon the method of its administration. Anesthesia should not be induced too rapidly. For instance—were we to administer pure Nitrous Oxid from the beginning without dilution with Oxygen or air, Nitrous Oxid acts so rapidly, it would anesthetize the nerve centers with which it first comes in contact before there was time for general distribution of the gas, and the patient would show pronounced anesthetic symptoms before complete anesthesia was actually accomplished. If operated upon, the patient might feel pain.

We, therefore, allow time for proper distribution by administering for one minute proportions as follows: Nitrous Oxid 95 per cent and Oxygen 5 per cent, in sufficient quantities to supply breathing. Then the Oxygen is shut off and pure Nitrous Oxid administered until

satisfactory anesthesia is produced. For the normal adult about forty seconds is the time required; for children ten to fifteen years of age, thirty-five seconds; for children ten years of age and under, thirty seconds. Then Oxygen is again added and we are ready to operate. The induction period (universal dosage) then for normal adults is one minute and forty seconds; for children ten to fifteen years of age, one minute and thirty-five seconds; for children ten years or under, one minute and thirty seconds.

It has been the general opinion that patients varied greatly in susceptibility to gas anesthesia; that each was a law unto himself and that symptoms were the only guide to determine when the proper stage of anesthesia for operation had been reached. It is doubtless true that patients vary slightly in susceptibility, but the anesthesia range is sufficient to permit administration of a universal dose to normal individuals.

Anesthesia range is a coined term to represent the range from the point of anesthetization to the point where pronounced symptoms appear. In normal individuals the range is practically uniform. In alcoholics and drug addicts, the point of anesthetization is moved toward the point of pronounced symptoms in proportion to the physiological changes, due to the drug. The anesthesia induction period for these cases is correspondingly lengthened, and the anesthesia range is proportionately narrowed.

Last year I tried various methods of inducing anesthesia in approximately 4,500 cases and am satisfied that the dosage described above, (for normal adults) namely, Nitrous Oxid and Oxygen (95 and 5), administered for one minute, followed by pure Nitrous Oxid for forty seconds produces the best results. (For convenience, let us call this "universal dosage"). By this method, nausea and depression are reduced to the minimum. In fact I have never had so little nausea, and while no record was kept, I dare say that nausea or vomiting occurred in less than one per cent of cases anesthetized. A stop watch attached to the apparatus was used in timing the induction.

All of the above timing is dependent upon the snug application of the inhaler and mouth cover to the face so that no air is admitted to the patient.

Of course, symptoms at all times should be observed and heeded. Timing standardizes anesthesia induction and furnishes the anesthetist the cue as to when he may expect the patient to become anesthetized.

Using the above technic, this year accurate record was kept of the inductions of 2044 consecutive anesthesias. Of this number 1828, or approximately 90 per cent, responded to the universal dose and were classed as normal and divided according to age as follows: 1715 adults were anesthetized in 1 minute and 40 seconds; 43 children, age 10 to 15 years, were anesthetized in one minute and 35 seconds; 70 children, age 10 years or under, were anesthetized in 1 minute 30 seconds.

The remaining 10 per cent of patients required 5 to 20 seconds longer induction and were classed as abnormal. By observation and history obtained, they were divided into three types as follows: Athletics 67, (robust individuals more resistant to anesthetic influence), stimulated 113 (habitual users of alcohol or narcotics); excitable 19 (the nervous or hysterical type). Seventeen *apparently* normal individuals varied from universal dosage as follows: 9 were anesthetized in 1 minute 50 seconds, 3 in 1 minute 35 seconds, 1 rapid breather anesthetized in 1 minute 35 seconds, and 1 shallow breather, and one shell-shocked soldier who were anesthetized in 1 minute 50 seconds, and two children, age 10 to 15 years, anesthetized in 1 minute 30 seconds.

The routine of gas administration in

abnormal cases is the same, except that after the gas is started it is well to pass a web trunk strap around the back of the chair and across the patient in line with the elbows, thus preventing the patient's movements from interfering with the operation. The strap should not be removed until the patient has recovered sufficiently to expectorate when requested to do so, as often the greatest excitement occurs during the awakening.

In the athletic type, while the induction period is longer, the anesthesia range is normal and they may be carried easily and safely thru anesthesia. If disturbed by dreams, their experience is usually pleasant. Any struggling or excitement during the induction or awakening is an attempt to execute movements in accordance with their dreams; and not of the vicious nature encountered in the alcoholic or narcotic addicts.

The nervous or hysterical type are apt to have a longer induction period because of irregular breathing or conscious effort to resist the anesthetic. Their anesthesia range is normal and when once anesthetized their behavior thereafter is about that of normal patients.

The greatest difficulty is encountered with the over-stimulated type. Alcoholics and drug addicts present similar difficulties. As previously stated, in proportion to the physiological changes due to the drug, the induction period is lengthened and the anesthesia range is narrowed. In extreme cases the range is seemingly obliterated. Even tho anesthesia is carried to the limit of safety and the most pronounced symptoms appear, the patient will often resist and stare with open eyes. If operated upon, they may cry out, but will afterward have no recollection of pain, only they will tell you of some harrowing dream. Their induction and awakening is accompanied by excitement and sometimes vicious struggling. In these cases the restraining strap is imperative and should be applied immediately after starting the anesthetic. There is danger in trying to force this type of patient into quiet anesthesia. It is better to operate when pronounced symptoms appear.

If the well advanced stimulated type is recognized before general anesthesia is begun, it is preferable, for operator and patient, to use local anesthesia where the operation will permit. If the use of gas is imperative, a hypodermic of morphine and atropin given half an hour previous to the anesthetization will be beneficial. I have had such patients thus treated respond normally to gas anesthesia.

Since in mouth operations the mouth is necessarily open, the patient may obtain sufficient air from this source to lighten the anesthesia. A gauze sponge to which a string is tied should be placed in the posterior part of the mouth to close off mouth breathing as much as possible. The gauze also absorbs the blood and prevents extracted teeth from falling into the throat.

It is well to force a stream of the mixed gases thru the nose while operating to prevent as far as possible the inhaling of air.

As the element of danger accompanies the administration of all anesthetics, some of them may well be mentioned here. There is first the danger of an over-dose of gas. The symptoms would be rapidly deepening cyanosis, marked jactitation and sometimes stertorous breathing. Finally cessation of breathing. The breathing may also be suddenly stopped in any stage of anesthesia by the tongue dropping backward or by the tongue being forced back by the packs or the fingers while operating. Usually breathing will start immediately when the tongue is brought forward out of the throat.

Should the patient fail to breathe reasonably soon, pull the tongue forward and administer artificial respiration.

This can be accomplished in several ways. It is usually sufficient to make intermittent pressure on the chest with one hand, while the other is employed in holding the tongue forward. If this does not suffice, place the patient in a recumbent position, employ more vigorous methods of artificial respiration, and administer oxygen.

It has been my experience that in all cases of cessation of breathing, the patient has quickly recovered after the admission of even a small portion of air into the lungs. Hold the tongue forward and at the same time produce artificial respiration. Should breathing cease from an over-dose of Nitrous Oxid, there is the same resuscitation period as in drowning. There is need of prompt action, but no necessity for haste. Calmly proceed to restore respiration.

A mouth gag and mouth pry should always be at hand for emergency, should the patient throw the prop already inserted.

All tongue forceps do more or less injury to the tongue. The best means of bringing the tongue forward is to pass the fore-finger back over the base of the tongue until it touches or is near the epiglottis, then holding the finger rigid in the curved position, pull forward and upward. The finger thus manipulated accomplishes three things: brings the tongue forward, opens the epiglottis and keeps a passageway clear for air to enter the lungs.

Care should be taken that no extracted teeth, fillings, or fragments therefrom fall into the throat. Were these to enter and remain in the trachea, their presence would cause irritation that might be serious, if not fatal. Every extracted tooth or tooth particle should be accounted for and removed from the mouth before proceeding to operate further.

Nitrous Oxid-Oxygen tends to produce exhilarating and pleasing sensations. Experiences of patients vary according to temperament and their mental and physical condition. A normal healthy individual with a happy disposition usually has a pleasant experience. The dreams of a patient are often directed by a thoughtless remark during the induction of anesthesia. Therefore, perfect quietness should be maintained if possible.

Nitrous Oxid-Oxygen is not indicated for all mouth operations or for all patients. Local anesthesia should be employed where difficult dissections can be better accomplished, with a clear field for operation and with the patient's assistance.

Also local anesthesia is indicated for the advanced stimulated type of patients, and for others who have a decided preference for local over general anesthesia. However, Nitrous Oxid-Oxygen is applicable to a very large majority of our cases and is by far the safest and most preferable routine anesthetic for Dental Surgery.

Discussion.

W. H. DeFord, Des Moines, Iowa.

Dr. Heidbrink has made a most excellent practical contribution to the anesthetic literature of today, but the time allotted me for discussion is so brief it will be impossible to consider his paper in its entirety, but rather, I will touch upon but two phases he has sought to emphasize.

Hewitt and others have in years past experimented along the same line as Heidbrink, endeavoring to ascertain the average length of time required for nitrous oxid oxygen anesthesia induction, but the appliances used by these investigators were crude as compared with the more scientific and accurate appliance, and close fitting mouth and nasal inhalers of Heidbrink, and I am willing to concede that the "anesthetic range" as determined by Heidbrink should stand as a standard, and that his "universal dosage" is as nearly correct as possibly

could be determined, and these are valuable and useful from a scientific standpoint, helpful and beneficial to the experienced anesthetists, but should not be taken too seriously by men entering upon an anesthetic career, with little or no previous anesthetic experience.

We all recognize the fact that patients respond differently to drug administration. Half an ounce of castor oil will cause a copious evacuation of the bowels of one patient, while three ounces will have a less effect on another patient, a sixteenth of a grain of morphine sulphate, hypodermically injected, will entirely disguise the after pain of an operation for one person, while another to obtain the same relief will require a half grain or more; a tablespoonful of whiskey or brandy will intoxicate the speaker, and he has observed others, with envy, drink a large glass of same without any appreciable effect. We find the same variation with ether, chloroform ethyl chloride, nitrous oxid and all the general anesthetics, in different individuals, so we must not misinterpret what Dr. Heidbrink has said about the "universal dosage" and think that all we have to do is to procure a modern anesthetic appliance, adjust it properly for the "universal dosage," and employ the "anesthetic range" as determined by Heidbrink, and obtain universally perfect results.

One of the most careful, painstaking, skillful anesthetists I have ever known has administered ether to my patients for a period of more than ten years. This man always places his watch in plain sight, as he has determined a universal ether dosage, and frequently gives me the signal to operate at the very minute, but he uses his watch only as an aid, only as a guide to determine the proper degree of anesthesia but never gives me the cue to begin operating until the patient is surgically anesthetized. I am sure this is what Dr. Heidbrink means.

Dr. Heidbrink properly states that "the element of danger accompanies the administration of all anesthetics." He calls attention to the dangers, symptoms, and treatment of an overdose of nitrous oxide. The possibilities of an overdose should be uppermost and constantly in the mind of the anesthetist. He should never become careless and overconfident. Those who appear to be the safest often prove to be the most dangerous risks.

Not since Horace Wells discovered the anesthetic properties of nitrous oxid has the oral surgeon, the general practitioner of dentistry, the extraction specialist, the oxodontist, the heliodontist, and all other "ists" who, upon occasion, finds it necessary to extract teeth, faced such a tremendous responsibility as is forced upon us today.

We have to go back in memory only some five or six years, when the dental surgeon, opening his reception room door, finding several patients waiting, upon questioning them as to their needs, would receive the following replies:

No. 1 says: "Doctor, I have been awake all night with a jumping toothache."

No. 2 says: "See how my face is swollen, I can hardly see out of my eye."

No. 3 says: "That old long standing pyorrhea has tuned up again, and I must have relief."

No. 4 says: "I have a lower wisdom tooth that is causing me intense pain, and I can hardly open my mouth or swallow."

No. 5 says: "I have a number of cavities of decay that need filling."

No. 6 says: "I have come to consult you about having made some artificial teeth," and so on. This sounds familiar to all of us.

Today we step out into our reception room and interview our patients, especially is this true of the exodontist, and note the nature of the replies:

No. 1 says: "Doctor, I have been los-

ing weight rapidly for the past few months, my *physician* has looked me over and says he can do nothing further until certain teeth are removed, the poison from which, being absorbed, is responsible for my condition."

No. 2 says: "My blood pressure has been increasing the past year, and my *physician* tells me it is caused from a condition of pyorrhea, and orders me to have all of my teeth extracted."

No. 3 says : "My joints are swollen and painful, arthritis, my *physician* refuses to further treat me till my teeth are taken out."

No. 4 brings a radiographic film. "My *physician* says there are abscesses at the root ends of several of my teeth which are responsible for my endocarditis."

No. 5 says: "*My physician* pronounces my case neuritis, believes my teeth are responsible for same, and one or more should be removed."

In the first group of cases we note that the patients presented of their own free will, no reference whatever being made to their physical condition; the second group, their *physicians* discovering systemic lesions secondary to dental lesions, indicative of rotten arteries, impaired heart muscles, tubercular lungs, abscessed livers, suppurating gall ducts, paralytics and semi-paralytics, some of them just barely alive, others with only a few months, weeks, or days of life at the best, brought to our offices to have their teeth extracted, their medical advisors holding out to them that the removal of their teeth and that alone, offered the only remaining chance of recovery.

The tremendous risk we assume in anesthetizing the class of patients referred by physicians, coming to our offices with their cases diagnosed, is not nearly so great, as the risk we assume from patients who come of their own accord, whose physicial condition is equally alarming, yet they themselves have no knowledge of the seriousness of their condition, or if they have, make no mention of the fact, and we must be skillful enough to diagnose same ourselves.

In a paper read before the Mid-Winter Clinic of the Atlanta Society of Dental Surgeons, March 14, 1918, at Atlanta, Ga., and published in The American Journal of Surgery, May 1919, Hartzell, of Minneapolis shows that "heart disease is a greater menace than tuberculosis, that many more deaths are resulting from heart disease than tuberculosis. The principal source of infection is the enormous growth of streptococcus viridans in the oral cavity and on tooth surfaces, whence it enters the circulation thru pyorrhea pockets, chronic dental abscesses, and tonsil crypts." So, when we take into consideration the enormity of heart lesions many times the patients themselves being ignorant of their condition, and the prevalence of hidden acute and chronic kidney lesions, rare discrimination must be exercised.

The speaker recalls a case of a prominent business man, for whom he administered an anesthetic and removed an impacted third molar. This man was the very picture of health.

In looking over the evening paper just a week later we learned that he was found dead, sitting in his chair at his desk. His head had fallen forward and it was supposed that he had fallen asleep.

A physician who specialized in anesthetic administration stopped me on the street one day and asked, "How did you get along with Mrs. ——, whom I sent you." I replied no trouble whatsoever. Then he said, "I would not have anesthetized her for a thousand dollars." Yet this physician without a word of warning, allowed me to assume that risk, and chuckled as in the parlance of the street, "he was putting one over on us." The exodontist is constantly having such

risks pushed onto him by physicians and if we do not learn to carefully discriminate we will surely have fatalities.

Some three months ago, an ex-Methodist minister was referred to our office, he was invited to take the operating chair for tooth extraction. He preferred to wait a week. When he returned his physical condition was such, we refused to take his case, told him to have his physician build him up physically, first. He replied that his physician said until his teeth were extracted he could do nothing for him. He was again refused service, and in looking over the death notices in the newspapers ten days later, saw his name.

During the past year in Iowa, three well authenticated nitrous oxid deaths have been reported, and others, not authentic, from or as the result of an esthetic administration for tooth extraction.

It has been the privilege of the speaker to administer or to personally superintend the administration of nitrous oxid, nitrous oxid and oxygen, ethyl chloride and its mixtures one hundred thousand times without a death. Never has he found it necessary to administer a hypodermic for resuscitation purposes. Cessation of breathing for a few seconds, responding immediately to pulling forward the tongue and artificial respiration in the dental chair, has proved ample in the way of resuscitation.

But the speaker regards the future as most perilous, and what has happened to others can happen to him, and even more care and discrimination in diagnosis must be exercised in the future than in the past.

We should guard most zealously the heritage of Horace Wells that has been passed on down to us by such men as Colton, Thomas, Nevius, Slonaker, Teter, Hasbrook, Brom Allen, and others, and see to it that nitrous oxid shall maintain so far as we possibly can its incomparable record as the safest of all anesthetics. But, taking into consideration the nature of the class of dangerous risks that are constantly presenting, the nitrous oxid record for safety is bound to be shattered, shattered in spite of our most persistant efforts.

We go back in memory but a few years and recall the time when the extraction specialists in the United States could almost be counted on the fingers of our two hands. One in Boston, two in New York, one in Philadelphia, none in Baltimore, one in Washington, two in Chicago, none in Minneapolis or St. Paul, one in St. Louis, none in Denver and none in Los Angeles. But today they are springing up like mushrooms over night. Some of these men take a two or three weeks' course in exodontia, others no course at all, relying upon a ten or fifteen dollar per week office girl to administer their anesthetics. Naturally we must look for and expect an enormous increase in the death rate, taking into consideration the inexperienced class of men entering the dental anesthetic field, and the dangerous risks being referred to us by the medical profession.

The message brought by Dr. Heidbrink is a timely one, and he could have rendered no greater service than to emphasize the importance of avoiding administering an overdose of nitrous oxid, just at this time.

In closing I quote McKesson, of Toledo, "Never administer nitrous oxid to a dead man."

W. I. Jones, Columbus, Ohio.

I have given nitrous oxide to something like twenty-five thousand persons and I consider it the most dangerous anesthetic in the world, when administered by inexperienced persons. At the last meeting of the inter-state association of anesthetists a physician from Sioux City, Iowa, had the courage to report a death from nitrous oxide in a dentist's chair. The patient was brought in to have some cavities prepared. The pa-

tient was put to sleep and in a few minutes commenced vomiting, and very shortly she was dead. That was a death occurring under nitrous oxide anesthesia, and it is my opinion that many more have occurred in the United States that have not been reported. I wish to state that I consider it the most dangerous anesthetic there is, and at the same time one of the best anesthetics, dangerous because of the rapidity of its action, and a good one because of its low toxicity.

John W. Seybold, M. D., D. D. S., Denver, Colo.

I have enjoyed Dr. Heidbrink's paper and want to say that it has given me a new thought.

The idea of using a stop watch, I believe to be a good one, as it will give a workable basis whereby the young anesthetist can more quickly master the subject of Gas Oxygen anesthesia.

For the past ten or eleven years I have been administering this anesthetic in the various hospitals of Denver for major surgery. The greater percentage of these patients were moribund or nearly so, and therefore my ability was taxed to the very limit. The slighest mistake meant the death of the patient.

You will agree that one working in such a field will have certain fixed ideas in regard to anesthetic technic.

So I have come to believe that in order to administer these gases with any degree of safety, one must absolutely give the anesthetic according to the physiological symptoms as they are developing. In other words forestall them. Therefore, no attention is paid to percentages or to time required to bring the patient into a safe state of surgical anesthesia.

The foregoing technic has been very successful in my oral surgery.

In regard to the restraining strap. I think that it should be applied as soon as the patient gets to a point that its application will be unnoticed. It should be removed as soon as the work is completed, and before the patient regains consciousness.

Alcoholics, drug addicts, snuff users and smokers should be advised to follow their usual custom in that regard. This will bring them to operation in their own individual normal condition.

In case of anesthetic collapse in the chair, I believe that the patient should first be put in the Trendelenberg position, in order that the blood quickly reach the brain centers. The tongue should then be taken care of as Dr. Heidbrink has suggested and artificial respiration started. In other words, don't waste any time trying to resusitate a patient in the sitting position, for the loss of a minute or so, may be the life of the patient in a close risk case.

In conclusion, I want to thank and compliment Dr. Heidbrink for his paper. It is short, meaty and to the point. Let us hope that others will get his idea.

Boyd Gardner, Mayo Clinic, Rochester, Minnesota.

Dr. Heidbrink has favored us with a paper on nitrous oxid anesthesia somewhat out of the ordinary, inasmuch as he has eliminated the history of this wonderful anesthetic, which is so well known to all of us, and has given us interesting data from the very first. While the most interesting phase of this whole paper is the induction time with given percentages of both nitrous oxid and oxygen, my discussion will cover the points in the order given.

Nausea following the administration of this anesthetic has been more or less of a draw-back, but if the anesthetist would bear in mind that the change of the patient's position too soon following the operation is frequent cause of nausea, quite a percentage of such cases could be avoided. No doubt operators are overly anxious to see their patients out of the anesthetic and tend to disturb them too quickly. Again, they are apt

to remove them from the dental chair to the rest room at a time when the patient should not be disturbed.

If sponges are properly placed to take care of the hemorrhage, there is no need of forcing patients to empty their mouths until they are sufficiently out of the anesthetic to know what they are doing. If patients are undisturbed for five or ten minutes following an extraction, it is surprising how much better they feel than when the anesthetist arouses them before they are aware of their surroundings. Then too, a large percentage of these patients would be able to leave the office directly from the operating chair.

It is evident that Dr. Heidbrink has given the induction time very careful thought, and the report of such a large number of cases gives us definite data. There can be no question regarding the time of induction in the large percentage of cases, however, this percentage will vary with the class of patients. For example, patients, who are able to walk to the dental office, should be classed differently than those, who are hospital cases.

With regard to the use of a strap to hold patients in the chair: The operator would no doubt benefit in handling a certain percentage of patients, but the use of a strap as a routine could be criticized unless it was adjusted without the knowledge of the patient. The anesthetist would be more or less handicapped in carrying out her work if a strap was adjusted before the anesthesia was started; the good results of suggestion would be entirely lost.

The position of the patient in the chair is all important to the operator, and by the use of dental chairs without foot-rests, it has been found that the patient keeps his position much better, as he cannot get a foothold to throw himself back if an attempt is made to resist the anesthetic. Again, if the patient is asked to fold the hands in the lap, the possibility of pulling himself out of the chair by grasping the arm-rests is eliminated to a large extent. By having these two points in mind, we are able to keep the patient in the position that makes good operating possible.

The use of gauze sponges properly placed in the oral cavity in the extraction of teeth should be encouraged. This is not only easier for the anesthetist, but it lessens the danger of our work. Data on lung abscesses following the extraction of teeth is being gathered, and it is surprising to learn the number of fatalities resulting from this cause. It is very easy for parts of teeth, fillings, tartar and dirty blood to be inhaled during extraction under a general anesthetic, and by the use of such large dry gauze sponges, it is almost impossible to inhale anything that would be detrimental to the patient.

In conclusion, it might be well to state that the use of nitrous oxid should be encouraged, as when teeth can be properly extracted by its use, it has great advantages over any other anesthetic, particularly when we consider the postoperative effects. Not only does the blood coagulate quicker, but the sockets are benefited by a better hemorrhage. However, there are many cases of extraction in which conductive anesthesia has advantages over nitrous oxid. We should consider the welfare of our patients and use the anesthetic which will give them the best results. It becomes more or less of a personal equation, for in the hands of one operator conductive anesthesia would be indicated, while in another nitrous oxid would be far better. In other words, the dentist should make use of the anesthesia, which, in his hands, will give the best results to his patients.

C. F. B. Stowell, Chicago, Ill.

There is but little to discuss in the paper. Therefore, I will take but very little of your time.

Inasmuch as the essayist has taken a

position on some of the subjects that necessarily come along with a consideration of the topic, Anesthesia, in which I have always held and taught opposite views, it will suffice this discussion to adhere only to *them* in the interests of brevity.

I am assuming that nearly all present are familiar with *a* technic of anesthesia which you use daily and from which you depart but very little. I am also assuming that nothing that I shall say nor anything that our essayist has said will cause any to modify the technic you are each using right now with satisfaction to yourselves and also them you are serving. I am assuming this for this reason: I have watched many men in our profession in its various lines of activities and from this observation I notice that they do not change.

To the men who have not given time to the subject of anesthesia and are looking forward to doing so, I would say that the paper is very misleading. Followed, it is certain to cause many to fall into "Sloughs of Despond." The mischievous part that I particularly would call your respectful attention to is that part that deals with "Dosage and Percentage." While it might be contended that it is a recognized principle of Therapeutics that drugs and doses are as necessary almost as diagnoses and admitting this and also admitting that there exists such a thing as the maximum and the minimum doses, it might be added as a corollary that there is an infinite number of divisions between the least dose and the greatest dose. This is very true of the drugs known as anesthetics. The great difference as I see it between an anesthetist and a Therapeutist is simply this: The first actually administers the drug waiting the while to take cognizance of its effect, giving more, giving less, as the case in hand requires, whilst the therapeutist prescribes and goes on his way. The latter has reduced all mankind, and God help us, to a mathematical formula, to which if we take kindly all is well. There is nothing exact in nature. Nature is so variable that it passes our comprehension.

The man who would succeed in dealing with a man for any purpose whatsoever must perforce deal with him as an individual. The anesthetist must study, after the principles of anesthesia, the individual he is about to anesthetize. After he has started the administration he must observe carefully the changes wrought. He must know that certain reflexes are affected, he must note color modifications, he must have a firm and steadfast confidence in himself in case of emergencies, he must change his attitude toward the case instantly when he realizes that his first analysis of the patient is faulty. To be able to do all these things and do them almost automatically needs careful training in the office of an experienced man, or not quite so good in one of the great free clinics of a large city.

I contend as emphatically as I can that it is a great wrong to lead anyone to think that all he has to do is to give a certain mixture for a certain length of time and a working anesthesia results. Why? Simply because such is not the case. Such statements lead and have lead many to the purchase of a machine first. In lieu of this I would advise study first. After a thoro study, a little practice.

Practice anesthesia only. Do not fall into the error of trying a major extraction or the extraction of a large number of teeth. After you have a fair knowledge of the subject and have a technic developed, if you are good at the extraction of teeth and can perform almost as a reflex action you are in a position to start uniting the two distinct performances. From this point, watching your-

self carefully you are ready to start developing yourself.

A struggling vicious patient as referred to by the essayist should not be operated. Conductive is here indicated or ether in a hospital. Nitrous is *never imperative.*

Carbon Dioxid and not Oxygen is the respiratory stimulant. I consider that the study of equal importance with the study of theory of Anesthesia is the study of what to do in an emergency. This might seem superfluous. Is it?

Nausea is best treated by prevention. To prevent nausea allow no blood to reach the stomach. I have no nausea in my practice. In fact I had almost thot it had been eliminated from nitrous oxid anesthesia.

Not having worked in a clinic for some years, I have to rely on some of the things done in the extracting clinic of Northwestern University by me over six years ago. This goes to show the variableness in the matter of dose. I have obtained eighteen (18) short but workable anesthesia from a 100-gallon cylinder of nitrous oxid. I have with the same apparatus failed to obtain one (1) workable anesthesia from 100-gallon cylinder. Of the 18 patients seven were between 20 and 45, the others were under 20 and over 5.

Dr. Heidbrink (Closing): I much regret the absence from the meeting of Dr. DeFord. His wide experience with nitrous oxid-oxygen anesthesia and his contribution to the literature establishes him as a valuable authority on the subject. The reader of his discussion volunteered the opinion that nitrous oxid-oxygen is the most dangerous of anesthetics. This opinion he based upon knowing of one death. That authorities generally concede nitrous oxid-oxygen to be by far the safest of anesthetics is a matter of common knowledge. Therefore nothing further need be said upon the subject.

I wish no one to misconstrue my paper to mean that all that is required to administer nitrous oxid-oxygen is to administer a certain dose for a certain time without proper regard for symptoms. The paper clearly states that symptoms must at all times be observed and heeded. The object of the paper is to suggest a means of standardizing the induction and maintenance of gas anesthesia. The dosage standardized and timed proves clinically to apply to a large majority of cases. Any who do not agree as to the dosage or timing described, may change it to obtain the results desired.

Just a word concerning Dr. Gardner's objection to strapping the patient. Since it is not possible in all cases to anticipate excitement and struggling, it is safer, and much annoyance is avoided by placing the strap on all men. Soon after starting the anesthetic the strap can be applied loosely and then tightened just before the patient becomes anesthetized. If there is no struggling, the strap can be removed without the patient knowing it was applied. I have found no objection to the use of the strap.

PHARMACOLOGY, ACTION AND TOXICITY OF VARIOUS LOCAL ANESTHETICS.

By S. L. Silverman, D. D. S., Atlanta, Ga.

(Read before the National Dental Association at Its Twenty-third Annual Session, New Orleans, La., October 20-24, 1919.)

THE popularity that local anesthesia enjoys, has given the medical and dental professions some concern as to the reliability of the American made synthetics. I have, in recent years, been asked numerous times whether the American-made procain compares favorably with the product imported from Germany. So prevalent are these queries, born, no doubt, of suspicion, that I have thought upon several occasions to announce my opinion in print. My unequivocal answer is that both chemically and clinically is the American product the equal of the imported. To be sure, rumor has it that novocain can not be manufactured here and for that reason is called procain. Others say that while the American procain is sufficiently like the German product, it cannot, for fear of violating the Pure Food & Drug Act, be called novocain, and have, therefore, changed the name from novocain to procain. Nothing could be farther from the truth, and when I hear these groundless assertions I feel that propaganda has not entirely been stifled. The real reason for the change in name is due to the decision of the Federal Trade Commission, and this applies to other synthetic drugs; such as, salvarsan whose official name is Arsphenamin; Veronal, whose official name is now Barbital, etc. The Federal Trade Commission, even before the "Trading with the enemy" act was passed on September 28, 1917, had wisely considered the annulling of enemy owned patents. The easiest way was to change the name and thus be able to continue manufacturing these products after the war, irrespective of the U. S. patent No. 812,554 issued to Alfred Einhorn, of Munich, Germany. American pharmaceutical houses, when applying for a license, had to produce drugs that were either the equal or the peer of the German products. The Committee on Synthetic Drugs in collaboration with the A. M. A. chemical laboratory, and other reputable laboratories, found these American drugs identical with the German made. Hence the H. A. Metz Lab., the original importers of novocain, as well as the Abbott Lab., the Calco Chem. Co. and the Rector Chem. Co. were granted licenses for the manufacture of procain. Those of us who have used large quantities of imported and indigenous procain, find not the slightest difference. This applies both to normal and toxic behavior.

That in some few isolated instances untoward sequelae follow procain administrations I do not deny, but by no manner nor means is the unpleasantness to be imputed to the drug per se. As I have before pointed out, we are too

prone to impute to the drug all unpleasantness that may arise, with a culpable disregard to technic, to the personality of the operator, and to the condition of the patient. I have advisedly omitted mentioning idiosyncracy. This term with professional men has become as popular as the thread-bare and too oft repeated term "nervous" has with the laity. Both cover a great deal, but with Cartoonist Goldberg I must say "it doesn't mean anything."

I fear I may repeat myself to those who are acquainted with my writings on toxic manifestations in local anesthesia. If so, I ask their indulgence for the benefit of those who are interested in preventing eventful procain injections. I have said above that technic, the operator's personality, and patient's condition or even coincident events that may arise do not get the consideration due them. I will promise you immunity to faints, partial collapses, etc., if you follow the following rules. First you must have a pleasing and non-formidable personality. Employ tactful diplomacy prior to insertion of the needle. Do not call to your assistant to bring you "novocain." Employ some other term. Personally, I use the term "solution." Do not flourish or call for a syringe. The average patient had just as soon have a revolver so displayed. Do not use terms that border on or resemble stabbing or other possible puncturing violence, e. g. "I will *inject, insert, shoot some dope in you,*" and so forth. By dint of repetition, a procain injection may be so extenuated in the operator's mind that we lose sight of the psychic effect produced on the patient. So much for personality. But fail to observe these points and you may inject pure water! and have the same accidents that you attribute to novocain. And again, coincident events never seem to most men to have any bearing when some accident occurs. People have been known to drop dead on the street, in theaters, in churches and at dinner tables, who have never even seen a hypodermic syringe. Some have fainted in all possible places, but let any of these accidents happen to a subject that had that day, that week, or that month had a local anesthetic administered and then the pink tea parties will cry idiosyncracy and long-faced professional men will echo "idiosyncracy," and to play on this word I say idiots.

The patient's condition, if his pulse or respiration is such that he is half alive, need not enter into consideration as to the employment of novocain, but less serious and more hidden coexistences may play a part. Secret drug addicts may be affected more than normal subjects. Arrested menses and especially the sudden onset of the menopause can tend to alarm all concerned following even a proper injection. Let me cite a case where a woman, following a novocain administration for the purpose of excavating a cavity, experienced a trismus of the jaw as well as an affection of other joints. The drug was, of course, blamed by the patient, her physician, and secretly by the dentist. As legal proceedings were about to be brought against the dentist, he, in order to protect himself, called me in, and during the consultation upon hearing that the patient was 48 years of age, I immediately suggested that the menopause (which she acknowledged almost under protest) as a recent event, was the sole cause. This, a sensible physician verified, because it is notorious that during their period of menopause women are very much subject to arthritis deformans and like disorders. I could, I am sure, write several hundred pages of supposed novocain sequelae that turned

out groundless when subjected to investigation.

Now, as to technic necessary to obviate trouble, use 1½% solution. Never over a 2%. If solution is slightly discolored it may be utilized. Do not use a badly discolored solution. Have patient reclining, this is very important. Empty syringe gradually. Never empty a syringe-full in less than 60 seconds. More trouble arises from disregard of this point than all other causes, including psychic. And before I discovered the time element I must confess that K. O's were somewhat in evidence in my office. Lastly, the typical nervous patient, after injection, should not be left alone to brood and concoct bugbears. Some one, preferably a sympathetic nurse, should attend them and tempt them from any gloomy thoughts. However, if the operator, minus personality or unappreciative of fruitful theatricalities, attempts to re-assure a patient and is himself uncomposed, who himself has a pallor and is vacillant, he will often cause, rather than obviate, so-called idiosyncratic manifestations.

INDICATIONS AND CONTRAINDICATIONS FOR NERVE BLOCKING ANESTHESIA.

By Frederick F. Molt, D.D.S., Chicago.

(Read before the National Dental Association at Its Twenty-third Annual Session, New Orleans, La., October 20-24, 1919.)

IN THE determination of the method of anesthesia to be employed for a given oral operation, several considerations must be given definite thought. These may be itemized as follows:

The nature of the operation to be performed.

The probable length of time that it will consume.

The condition of the parts to be operated.

Whether the patient's cooperation is needed.

Whether a bloodless field is required.

The temperamental type of the patient.

The patient's physical condition.

The patient's age.

The desires of the patient.

I have purposely placed the patient's wishes as the last consideration, for while there are those of the neurotic type that will be insistent, in the majority of cases what the patient wants must be subordinated to the operator's decision. Manifestly with his knowledge of the requirements in the case, he is in the better position to know what is required.

We must consider, then, for extended operations, the choice between nerve blocking and general anesthesia; and under general anesthesia we must give

consideration both to nitrous oxid-oxygen and to ether. Many operations that can be performed under nerve-blocking and not under nitrous oxid, may be done under ether. This presupposes hospitalization, however.

It must be acknowledged that while nitrous oxid-oxygen is an indispensable adjunct to the exodontist and oral surgeon, with the lack of preliminary preparation in the majority of cases, and the varying types of patients we have to deal with, many anesthesias are not ideal. Having the patient frequently far from relaxed and quiet, we may become fairly expert "wing shots," able to extract on the fly. Altho this may do very well for short and simple operations, where complications are anticipated or there is the possibility of the operation consuming considerable time, or if the operation is one of exceedingly great delicacy, one is constrained to choose between nerve blocking and ether anesthesia, with the balance greatly in favor of nerve blocking.

In the case of impacted lower third molars, unless one does the rapid operation advocated by Dr. Winter, nerve blocking is desirable, and all impactions are much better handled in this way.

Except in the case of complete or almost complete alveolectomy, in which cases ether is often preferable, the surgical removal of extensively abscessed teeth—the only rational way of operating such cases—is better done under nerve blocking. The extraction of devitalized lower and upper molars, even where there is no apical involvement, but where we may expect the tooth to shatter and be removed in fragments, is best accomplished under local or block anesthesia.

In cases where infection has caused extensive swelling and infiltration, nerve blocking may safely be used, since the insertion of the needle may be made in healthy tissue at a point distant from the affected part. If, however, there is trismus to such an extent that opening the mouth is painful or impossible, a general anesthetic may be required to obtain sufficient relaxation.

My personal observation has been that in prolonged operations of the delicate type, I would much prefer to have the cooperation of the patient, for to have him able to turn his head as directed, hold his tongue away from the field of operation, open or close his mouth, is invariably of great assistance quite offsetting any disadvantage caused by excessive nervousness.

Of even greater desirability in these cases is a comparatively bloodless field, permitting close observation during the entire operation and the exercise of our best technical skill. Under no general anesthetic can this be so well obtained even by frequent and thorough sponging.

To be sure, we become accustomed in a great measure to working by sense of touch and sense of hearing, knowing our substances—bone and tooth—by their feel and sound. This can never, however, permit of the accuracy of operation that sight will, and if we can have an unobscured view of every step of the operation our results will give the maximum of satisfaction and the minimum of traumatic disturbance.

I have never been convinced thru observation that there is any appreciable difference in the recovery in those cases operated under nerve blocking as compared with those done under general anesthesia, the statement so frequently made that the vaso-constriction delays healing, to the contrary, notwithstanding.

As regards the temperament of the patient, there are those of the extremely

neurotic type to whom the thought of "knowing what is being done" is abhorent. In such cases where there is a great deal of work to be accomplished, and where it may be necessary, if this is done under nerve-blocking, to divide it into two or three separate operations, one is frequently obliged to turn to ether and to do all at one time.

At this point let me assert that even in the cases where extensive apical or pyorrhea involvement is present throughout the entire mouth, if the operation for the removal of the teeth is done by surgical procedure, one need have no hesitation on the score of "reaction" about extracting all the teeth at one operation. Since the removal of the outer alveolar plate permits of lifting out the granulomas intact, leaving no pathology and stirring up no infected tissue, the reaction will be neither violent nor dangerous.

To return to our neurotic patients, it has been my experience that almost as many of these dread loss of consciousness as are terrified at the psychic aspect of the operation. In handling this type of patients sedatives of the bromide class are valuable and "suggestive therapy" may accomplish much.

Block anesthesia is decidedly contraindicated in cases where epileptic tendencies are known to be present; in those suffering from heart lesions in advanced stages and in cases of arteriosclerosis and high blood pressure. If we find it necessary to use this method in these latter cases, however, the amount of vaso-constricting agent should be much reduced and the injection made very slowly and with the greatest care. Patients suffering from anemia or those in a condition of extremely lowered vitality are not good subjects.

The fact, on the contrary, that block anesthesia calls for no pre-operative preparation, and the absence of systemic after effects, either nephritic, cardiac or pulmonary, are distinct points in its favor. In addition, the resistance is not lowered and since our afferent sensory nerve fibers are anesthetized there is no traumatic surgical shock, and we have only psychic shock to consider.

Nerve blocking is, in most cases, contraindicated for operations on children. In those of advanced age where arterial or systemic complications are apt to be present, one should exercise extreme care in its use.

Having in mind these physical contraindications, we may repeat that the balance is greatly in favor of nerve blocking anesthesia. Practically every operation that can be performed under general anesthesia may be done under blocking, provided, of course, that it is possible thoroly to anesthetize the area to be operated. The factors of bloodless field and patient's cooperation are of infinite value.

Therefore, eliminating the simple extractions and incisions, which one may do more readily under nitrous-oxid, any prolonged or delicate oral operation, whether it be the removal of a broken-off or an impacted tooth, the curettage of carious or necrotic bone areas, or cyst, or granuloma, may be accomplished with less trauma and more certain result under nerve blocking anesthesia.

THE JOURNAL of the NATIONAL DENTAL ASSOCIATION

Entered as second-class matter, March 22, 1915, at the Post Office at Huntington, Indiana, under the Act of August 24, 1912. Published Monthly.

Editor and General Manager,
OTTO U. KING, D. D. S., 127 N. Dearborn St., Chicago, Illinois.
Associate Editors,
THOMAS P. HINMAN, D. D. S., Atlanta, Ga.
HARVEY J. BURKHART, D. D. S., L. L. D., Rochester, N. Y.
THOMAS B. HARTZELL, D. M. D., M. D., Minneapolis, Minn.

All expressions of opinion and all statements of supposed facts are published on the authority of the writer over whose signature they appear and are not to be regarded as expressing the views of the National Dental Association, unless such statements or opinions have been adopted by vote of the Association.

SUBSCRIPTION included in the annual membership dues.

SUBSCRIPTION, $2.00 a year, in advance, to non-members, living in all parts of the United States or its possessions. Canada, $2.50. Foreign countries, $3.00. Single copies, 20 cents.

ADVERTISEMENTS accepted only from reliable firms. Fraudulent and misleading advertisements barred.

IN CHANGES OF ADDRESS both the old and new address must be given.

JOURNALS are not sent beyond the subscription period.

ORIGINAL ARTICLES, items of news and matter of interest to the profession are welcome. Request for reprints should be made at the time of forwarding articles.

VOL. 7 AUGUST, 1920 No. 8

Editorial Department.

THE ESSAYIST AND THE DISCUSSER.

It would seem that our editorial, "Short and Bibliographed Papers the Best Papers," appearing in The Journal on page 956, Vol. VI, has been called into question. When it was written no thought of argument was entertained, so none was given. It seemed that the reasons for a bibliography to alleged scientific articles were as obvious as the reasons for a code of behavior in a school room or in society.

The first reason for an appended list of works studied is a very personal one to the writer. It presents his first claim to recognition.

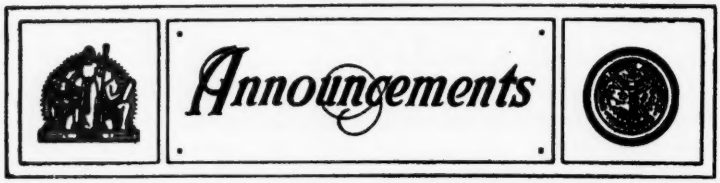
No man suddenly jumps to a position of scientific authority. Minds must be familiar with the fundamental subject matter of a science as well as have an acquaintance with its ramifications to be at all worth hearing. It happens commonly that a man finds his "bright idea" already tarnished with age when he essays to patent it. A bibliography assures that the writer has something to present sufficiently new to deserve presentation and that he is familiar enough with the field he traverses to deserve confidence as a guide.

It is apparent then that a man well enough versed to be heard will not be tempted to write for the sake of writing. If, in the past, contributors to our Journals had thought to search the literature before attempting to make any, much editorial anxiety would have been averted and many whose names and offerings appear often would have been saved denunciation by readers better read than themselves who scathe the repetitive penmen as self-advertising plagarists. Already some whose works are often quoted as authorities are losing rank because of their first person discoveries or researches that date back to a previous generation or century. There are places where their names are seldom or never mentioned for that reason.

There is also a moiety of courtesy and appreciation due to the men who laid the foundations of dental knowledge. The more is this to the point when we realize the mental energy and toil required in days when ways and means for research were not purchasable at a laboratory but were the products of the student's ingenuity when lacking the ability to devise his own instrumentation he must forego his interests. To men who know dental literature, it is patent that the history of dentistry is writable in the history of less than a half-dozen men. The great facts of operative therapeutic and surgical procedure, as well as the relation of the pure sciences to dentistry, would all be mentioned in the biographies of these beacon lights of dental history.

The reader is also considered as he should in the appendix of a bibliograph. Among the readers of all magazines are those interested in some of the related subjects. They have desired to know what has been done and how the results have been obtained, as well as the time at which and the person by whom they were presented, but they need direction. The bibliographer thus becomes an educator which is after all the purpose of all writing.

And lastly the writer owes something to the Journal that will print his contributions. Editors desire to place their journals high in the esteem of their readers. "I like the Blank Journal because it is a veritable directory in any department of dental science," is a compliment that editors covet; hence the request of the October number of 1919.



NATIONAL SOCIETIES, 1920.

August.

23-24-25-26-27—National Dental Association, Boston.

23-24—National Association of Dental Examiners, Boston.

23—American Dental Library and Museum Association, Boston.

STATE SOCIETIES.

November.

18—District of Columbia, George Washington University, Washington, D. C.

30—Dec. 1-2, Ohio, Columbus.

Arizona, Phoenix.

December.

10—Delaware, Wilmington.

Dates to Be Announced.

Arkansas, Little Rock.

California State.

Louisiana, New Orleans.

Oregon, Portland.

Washington, Tacoma.

SUSQUEHANNA DENTAL ASSOCIATION.

The fifty-seventh annual meeting of the Susquehanna Dental Association will be held at Hotel Sterling, Wilkes-Barre, Pennsylvania, October 26, 27 and 28, 1920.

FULLER L. DAVENPORT,
Chairman,
520 Miners Bank Bldg.,
Wilkes-Barre, Pa.

AMERICAN ACADEMY OF PERIODONTOLOGY.

The annual meeting of the American Academy of Periodontology will be held at the Copley-Plaza Hotel, Boston, Mass., August 26, 27 and 28.

B. F. MILLER, JR., Secretary,
104 Dryden Bldg., Flint, Mich.

ASSOCIATION OF MILITARY DENTISTS.

Association of Military Dental Surgeons will hold their annual meeting in Boston, Mass., August 24 and 25, 1920.

ROBT. T. OLIVER, President.
G. H. CASADAY, Secy-Treas.,
Presidio of San Francisco, California.

IDAHO DENTAL EXAMINATION.

The next examination for dentists will be held in this office on January 11, 1921. For application blank and law pertaining to this profession, address Bureau of License, Boise, Idaho.

PAUL DAVIS, Director.

AMERICAN SOCIETY OF EXODONTISTS.

The annual meeting of the American Society of Exodontists will be held at the Harvard University Dental School and Surgery, Boston, Friday and Saturday, August 20th and 21st. An interesting program has been arranged. All N.

D. A. members interested in this branch of practice will be welcome at the session and those eligible for membership are invited to make application.

FREDERICK F. MOLT, Sec'y.,
25 E. Washington St., Chicago.

JOHN R. CALLAHAN MEMORIAL FUND.

The interest of the members of the profession and the hearty cooperation of the committees representing the various states, whereby excellent results are being secured is thoroly appreciated by the General Committee.

The report shows a gradual and substantial progress toward the amount desired to establish the Memorial in its two phases. It is the desire of the committee that every state may have a part in making this in reality a National Memorial. Committees from several states report their lists incomplete, additional subscriptions from them will be forthcoming.

The General Committee believes that Ohio's total contribution to The Fund will be sufficient to more than pay for the Memorial to be placed in Cincinnati General Hospital Grounds, thereby leaving all other contributions to constitute the Memorial Fund.

Below is given a report of subscriptions to the Fund secured up to June 25th, 1920:

	Subscribed	Paid
Alabama State Society.....	$ 100.00	$ 100.00
Colorado State Society (Individual)	205.00	205.00
Columbia District of Society (Individual)	126.00	126.00
Florida State Society.....	45.00	45.00
Illinois State Society (Individual)	235.00	235.00
Indiana State Society.....	100.00	100.00
Kansas State Society.....	200.00	200.00
Louisiana State Society (Individual)	181.50	181.50
Missouri State Society.....	100.00	100.00
New York State Society.....	500.00	
New York 1st District Society..	200.00	
New York 1st District Society (Pathodontia Section)	100.00	
New York 2nd District Society..	100.00	
New York 1st & 2nd District Societies (Individual).....	169.00	
New York 5th District & Elmira Societies (Individual).....	105.51	
New York 6th, 7th & 8th District & Rochester Societies (Individual)	292.05	
New York Delta Sigma Delta (Individual)	200.00	
New York, Doctor F. W. Proseus	2.00	1668.58
Ohio State Society.....	1000.00	500.00
Ohio State Society, 2nd Installment due Jan. 1921.		
Ohio Cincinnati Society.....	300.00	300.00
Ohio Cincinnati (Individual)...	700.00	700.00
Ohio Cleveland Society (Individual)	500.00	387.00
Ohio Toledo Society (Individual)	100.00	100.00
Ohio Toledo Society.....	100.00	50.00
Ohio Toledo Society, 2nd Installment due Jan. 1921.		
Ohio Loraine Society.....	25.00	25.00
Ohio Mad River Society (Individual)	24.00	24.00
Ohio, W. H. Hayden Youngstown	10.00	10.00
	$2759.00	$2096.00
Pennsylvania (Central Society)..	26.00	26.00
Pennsylvania (Philadelphia Odontographic Society).....	25.00	25.00
Rhode Island State Society....	25.00	25.00
South Carolina State Society....	71.50	71.50
Tennessee State Society.....	100.00	100.00
Virginia (Richmond Society)....	25.00	25.00
Wyoming State Society (Individual)	12.00	12.00
Holland, Rotterdam Society.....	36.36	36.36
Doctor J. P. Buckley, Los Angeles, Cal.....	25.00	25.00
Subscriptions voted not yet received.		
West Virginia State Society....	100.00	
West Virginia Component Societies	100.00	
Oklahoma State Society.....	100.00	100.00

ARMY DENTAL CORPS.

Examinations have been in progress at the Walter Reed General Hospital in Washington this week for the promotion of Lieutenants G. M. Krouch, J. B. Mann, and B. M. Epes, in the list of Officers of that grade of the Army dental corps who have completed three years of service and are thereby entitled to advancement to the grade of captain. The other offi-

cers who are eligible to promotion will be examined at once by boards convened at Fort Sam Houston, the Letterman General Hospital in San Francisco, Manila and Coblenz. Much interest attaches to the result of the examinations which begin on July 7 of the dental reservists who desire to be permanent commissioned in the Army Dental Corps. There are 102 vacancies to be filled, and those remaining after appointments of reservists have been announced will be filled by qualified candidates from civil life. Some disappointment has been expressed that no more of these reservists of war service have applied for examination for permanent appointment, but it is known that many of them, who would otherwise have presented themselves for examination, have returned to private practice, since their discharge from the military establishment, and have invested in office equipment representing a substantial outlay in the individual case. Naturally, these men do not care to abandon the practice of the profession which they have resumed.—*Army and Navy Register, July 3.*

No information has been obtainable this week in regard to the examination of officers for promotion in the Army dental corps, and it will be a week or more before anything is known in regard to the appointment of emergency officers from whom it is hoped to fill a large number of the 103 vacancies that now exist. The authorities express some disappointment that there was not a large number of candidates from dental reservists who served during the World War, but the time that has elapsed since the discharge of many of these useful officers has enabled them to return to the practice of their profession in civil life, and, thus reestablished, few of them expressed a desire to enter the competition for appointments to permanent commissions. Consideration is being given in the surgeon general's office to an improvement of the field dental equipment so that there may be greater compactness in the arrangement of this material when it is transported into the field. Ingenious devices have been made which accomplish this purpose and overcome the difficulties of transportation.—*Army and Navy Register, July 24.*

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

Maj. Thomas L. Smith from duty at general hospital 31, Carlisle, Pa., to Fort McPherson, Ga., general hospital 6, for duty.

Maj. Nathaniel Barnard, Capt. William F. Blair, First Lieut. Edwin C. Osborn, honorably discharged.

Capt. Conrad E. Mortensen, having been absent without leave since August 13, 1919, is dropped from the rolls of the Army.

—*Army and Navy Register, July 3.*

Col. George L. Mason from duties at Camp Dix, N. J., to San Francisco and about August 5 to Hawaiian Department for duty.

Capts. Max Wassman, Jr., John L. Smeltzer, honorably discharged.

—*Army and Navy Register, July 10.*

First Lieut. William Stranathan honorably discharged. —*Army and Navy Register, July 17.*

Lieut. Col. Robert F. Patterson from duty at Camp Dix, N. J., to Camp Gordon, Ga., for duty as camp dental surgeon.

1st Lieut. Charles P. Johnson honorably discharged. —*Army and Navy Register, July 24.*

The following named officers of the dental corps are being examined for promotion from the grade of first lieutenant to that of captain: H. C. Feyler, E. M. Kennedy, H. E. Guthrie, J. H. O'Reilly, J. H. Jaffer, F. P. K. Barker, J. J. Weeks, F. E. Rodriguez, T. M. Page, C. B. Parkinson, J. H. Keith, W. H. Siefert, and W. W. Wooley. Examinations of other officers for promotion to the grade of captain will occur during 1920 as follows: H. Holmes, G. J. Sibley, G. B. Lacey, E. W. van D. Cowan, J. L. Olsen, C. W. Scogin, and J. G. Urban.

Capt. Roy C. Starr, from duty at Army and Navy General Hospital, Hot Springs, Ark., to New York and about Aug. 18 to Panama Canal Department for duty.

Capt. Fletcher D. Rhodes, from duty at Jefferson Barracks, Mo., to Hot Springs (Ark.) Army and Navy General Hospital for duty.

Capt. Clarence J. Wright, from duty at Camp Lee, Va., to Arcadia, Fla., Carlstrom Field, for duty.

Promotion of the following in Regular Army announced: To be captains: 1st Lieuts. George M. Krough and Beverly M. Epes, June 16, 1920.

1st Lieuts. Clarence M. Haskell, Richard S. Payne, and Allie Y. Russell, honorably discharged.

—*Army and Navy Register, July 31.*

In Memoriam

DEATH OF MAJOR GENERAL GORGAS.

Major General William C. Gorgas, U. S. Army, retired, former surgeon general of the Army, died early on the morning of July 4 at the Queen Alexander Military Hospital, London, England.

General Gorgas was born at Mobile, Ala., on October 3, 1854, and was educated at the University of the South, where he received his A. B. in 1874. Then he came North to the Bellevue Hospital Medical College, now a part of New York University, and received his M. D. in 1879.

After serving for another year at Bellevue as an interne he was, on June 16, 1880, appointed a surgeon in the Army. He saw service in Florida, in the West and on the Mexican border. He had risen to the rank of major in 1898, when he was sent with the expedition against Santiago and later to Havana to be the chief sanitary officer of that city during the American occupation.

Dr. Carlos J. Finlay in his epochal discovery of the secret of yellow fever transmission was not favored by General Gorgas, but, after a thorough test, Camp Lazear was founded, and Reed, Carroll, Agramonte and Lazear and their associates had performed their immortal work, demonstrating absolutely the correctness of Finlay's theory and opening the way for ridding Havana, Cuba, and the world of what had long been one of the most feared and deadliest of plagues, Major Gorgas was, of course, converted. He set himself to work with splendid energy and enthusiasm to put into victorious practice the Finlay theory. Before that time "yellow Jack" had claimed hundreds and sometimes thousands of victims yearly. In the 19 years since, not one single case has occurred in Havana.

Congress, in recognition of his work in 1903, by special act, made him colonel and assistant surgeon general, and then, two years later, he was sent to Panama and applied the principles which he had learned from Finlay, and within five years he had reduced the mortality from 8,000 deaths per year to 19. He became chief sanitary officer of the Canal Zone on March 1, 1904, and a member of the Canal Commission on March 4, 1907. Thus he served until January, 1914, when he was made surgeon general of the Army, with the rank of brigadier general.

Meantime, in the fall of 1913 he left this country on a leave of absence to go to South Africa on a mission of mercy. Among the negro laborers in the Rand mines pneumonia was incessantly epidemic with appalling mortality. He went thither with a staff of bacteriologists to investigate the causes of the

plague and to advise and perhaps execute measures for its abatement, a work in which he achieved a large degree of success. In recognition of that work Oxford University gave him the honorary degree of Doctor of Science. He was promoted to major general in 1915.

Upon retirement he became the permanent director of the International Health Board of the Rockefeller Foundation and went down the west coast of South America to stamp out yellow fever in its most formidable home in all the world, the plague port of Guayaquil, with unqualified success. In the spring of 1920 he started for South Africa again, but, on reaching London, was stricken with apoplexy.

General Gorgas received the honorary degree of Doctor of Science from the University of Pennsylvania, the University of the South, Harvard, Brown, Jefferson Medical College and Oxford, and that of LL. D. from the University of Alabama, Tulane University and New York University. He was the first non-Englishman to receive the Buchanan medal from the Royal Society. He received the Mary Kingsley Medal from the Liverpool School of Tropical Medicine, and the gold medal of the American Museum of Safety. He was a member, active or honorary, of numerous distinguished scientific societies in America, France and Great Britain.

The United States Government gave him the distinguished service medal, and, in June 1920, King George made him a knight commander of the Order of St. Michael and St. George.

Full military honors were accorded at the funeral, held yesterday noon in St. Paul's Cathedral, London. The body of General Gorgas will be sent to the United States on a Government transport sailing either July 14 or 16.

Mrs. Gorgas and Mrs. Noble will accompany the body home. Brigadier General Robert E. Noble, who had been in constant attendance during the illness of General Gorgas, will head the mission to West Africa.—*Army and Navy Register, July 10.*

DEATH OF DR. THOMAS L. WESTERFIELD.

Dr. Thomas L. Westerfield, of Dallas, after a brief illness, died at one o'clock Thursday morning, April 29th. Thus has passed away one of God's noblemen, a true gentleman, as honest and upright man as ever lived, a professional man of the highest type, and a friend of his fellow-men.

Dr. Westerfield was born at Glasgow, Ky., and received his early education at Louisville. As a very young man, he began the study of dentistry, later entering the University of Tennessee at Nashville, from which institution he received the degree of Doctor of Dental Surgery. He first located and began the practice of his profession at Jefferson, Texas, but in 1887 removed to Dallas, where he has since been in constant practice. He joined the Texas Dental Association in 1888 at the annual meeting held at Dallas; served as its president during the year 1897, and in recognition for having been a constant member for 25 years, he was made a "Good Fellow" at the 1913 meeting. He was an early member of the American Dental Association and continued so until its reorganization which resulted in the formation of the National, remaining a member of the latter body up to his death. He was also for many years a member of the Southern and remained so until its disorganization.

Dr. Westerfield was a constant attendant upon the meetings of the State Society and was deeply interested in and worked unceasingly for the upbuilding of

his profession. He first conceived the idea and urged the organization of a local society for the dentists of Dallas, and was its first president. He also served for several years upon the Texas State Board of Dental Examiners. His wife, who survives him, is well known to many of his old friends in the profession.

WAUKESHA COUNTY DENTAL SOCIETY RESOLUTIONS OF CONDOLENCE TO DR. A. C. COYLE.

Whereas, Dr. A. C. Coyle passed from this life on Monday, February 16th, at Glenview, Ill., on his way home to Oconomowoc, Wis., from West Baden, Ind., where he had gone for treatment to regain his health.

Dr. A. C. Coyle was born at Oconomowoc, Wis., on February 20th, 1879. He attended school at Oconomowoc, Wis., and later entered Marquette University, Dental Department, Milwaukee, Wis. Graduated in 1907 and located in Oconomowoc, where he enjoyed a splendid practice.

Dr. Coyle possessed many lovable traits and good fellowship which made him a favorite companion to all who knew him. He was president of the Waukesha County Dental Society and alderman of the First ward in Oconomowoc.

Funeral services were held on February 20th from St. Jerome's Catholic church. His remains were interred in St. Jerome's Cemetery, Oconomowoc, Wis.

Whereby our community has thereby lost a citizen, Dr. A. C. Coyle, held in highest honor and esteem, our society and profession a skilled and zealous member, and the family a kind and devoted husband and father. Therefore, be it

Resolved, that we, the members of the Waukesha County Dental Society, do hereby express our sorrow at the loss we have all sustained and offer our sincere and heartfelt sympathy to the family of our late brother in their hour of great bereavement. And be it

Resolved, that, in tribute to his memory, a page of our minute book be set aside and a copy of these resolutions be spread thereon and a copy thereof be sent to the family.

GEORGE W. C. MEYER.
A. N. NIGGENTON.
R. T. JONES.

MASSACHUSETTS DENTAL SOCIETY, 1918, 1919, 1920.

Active.

Adolphus F. Wyman, Ex-Vice President, New Bedford, June 7, 1918; 66 years.

Charles S. Wright, Peabody, June 7, 1918; 62 years.

Charles D. Cobb, Arlington, June 12, 1918; 50 years.

George R. Gray, Worcester, July 7, 1918; 50 years.

Fred J. McDermott, Worcester, August 11, 1918; 41 years.

Ellis E. Williams, Fall River, September 28, 1918; 30 years.

George W. Curtis, Everett, October, 1918.

Edward H. Whithan, New Bedford, October 6, 1918; 28 years.

Walter H. Clarke, (Greenfield) France, October 12, 1918; 36 years.

C. Edson Abbott, Editor, Franklin, December 27, 1918; 37 years.

Lieut. Charles S. Spencer, Concord, March 12, 1919; 50 years.

John F. Caulfield, Woburn, May 1, 1919; 44 years.

Benjamin A. Green, Springfield, September 3, 1919.

Roy C. Skinner, Boston, October 10, 1919; 45 years.

Leon H. Lally, Springfield, November 30, 1919.

Joseph K. Knight, Jr., Boston, January 21, 1920; 32 years.

Herbert F. Langley, Randolph, January 28, 1920; 38 years.

Lieut. Herbert A. Sturtevant, Cambridge, February 8, 1920; 47 years.

Life.

George A. Maxfield, Ex-President, Holyoke, July 30, 1918; 70 years.

John F. Dowsley, Ex-President, Boston, July 17, 1919; 66 years.

Lieut. George H. Payne, Boston, September 29, 1919; 51 years.

Honorary.

Otto Zsigmondy, Vienna, Austria, June 30, 1917; 57 years.

Thomas J. Giblin, Dorchester, February 2, 1919.

Newell S. Jenkins, New Haven, Conn., September 25, 1919; 79 years.

Corresponding.

James McManus, Hartford, Conn., February 9, 1920; 84 years.

George H. Ames, Providence, R. I., March 30, 1920; 72 years.

Each year the members of the Massachusetts Dental Society are called to mourn the loss of those who have been summoned hence by death. The sense of separation is never the same, nor in the nature of the case can it be, for the qualities which unite to form the various personalities of the members are endlessly varied, as well in those which make for friendliness, companionship and good cheer, as in the more serious side of personality, which appears as character and ability. In no small degree it is this variety in life, the sense of something which never was till now and never will be just the same again, which gives to regret, in the separation by death of friends and companions, its keen element of sorrow.

But the final mood in the sense of loss and separation is not usually a sad one. It lifts into happy consciousness all that was bright and helpful in the severed friendship, and it suggests that deeper stream of life which, amid the wreckage of unrestrained power in nations and individuals, and the blighting trail of indifference, selfishness and greed, holds on its way with increasing beneficence and vitalizing power. It suggests the sympathy which the members feel for the families and friends of those who have died and their desire to make this memorial as true and heartful a tribute as it is possible to be. It suggests also how precious are the memories of good lives and especially the lives of those one has known and honored.

HENRY H. PIPER
A. H. ST. C. CHASE
WALDO E. BOARDMAN.